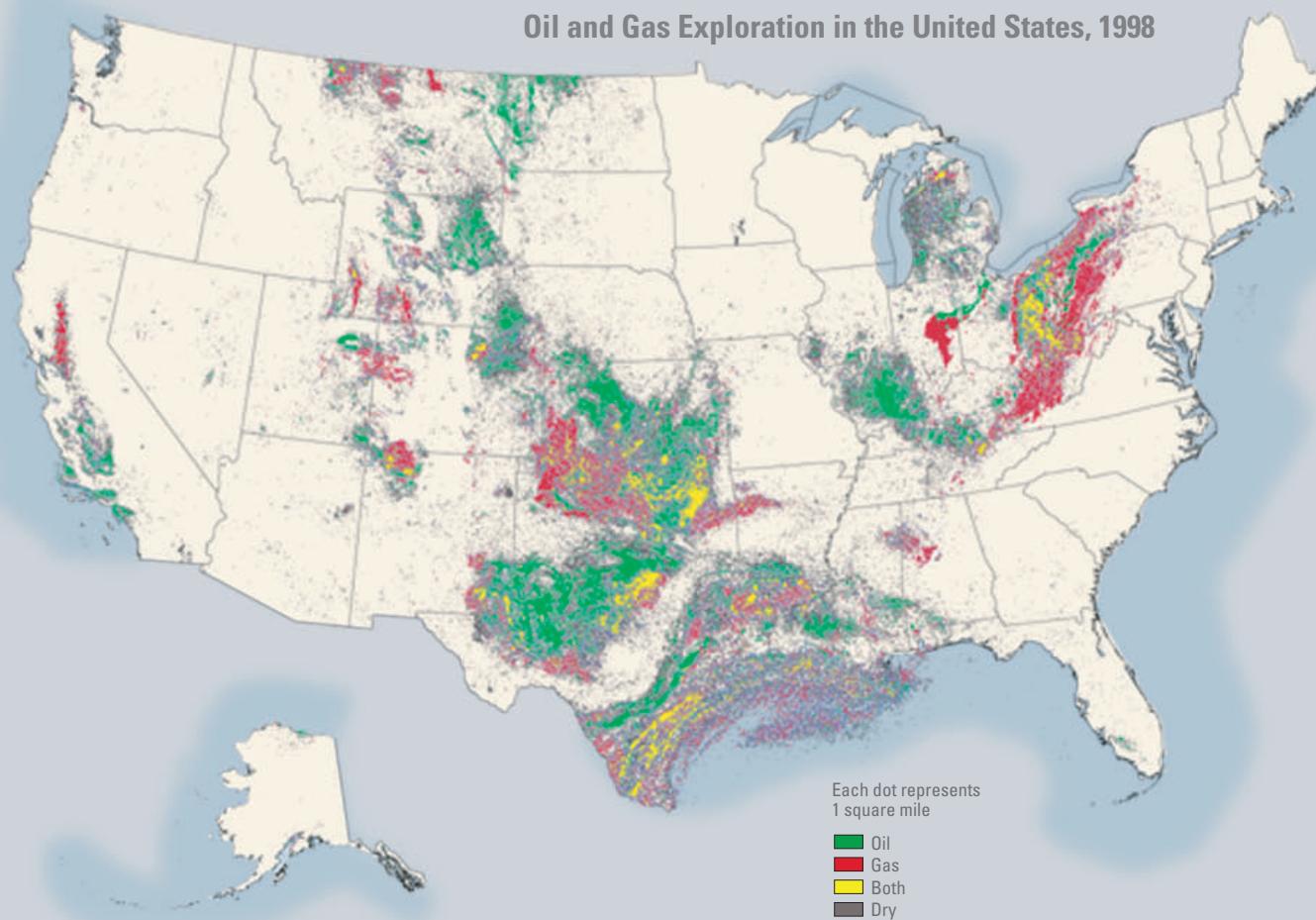


Graphical Comparison of Reserve-Growth Models for Conventional Oil and Gas Accumulations

Chapter F of
Geologic, Engineering, and Assessment Studies of Reserve Growth
Edited by T.S. Dyman, J.W. Schmoker, and Mahendra Verma

U.S. Geological Survey Bulletin 2172-F



Cover. This map represents historical oil and gas exploration and production data for the conterminous United States and Alaska. It was derived from data used in U.S. Geological Survey Geologic Investigations Series I-2582.* The map was compiled using Petroleum Information Corporation's (currently IHS Energy Group) database of more than 2.2 million wells drilled in the U.S. as of June 1993. The area of the U.S. was subdivided into 1 mi² grid cells for which oil and gas well completion data were available. Each colored symbol represents a 1 mi² cell (to scale) for which exploration has occurred. Each cell is identified by color as follows: red, a gas-producing cell; green, an oil-producing cell; yellow, an oil- and gas-producing cell; gray, a cell that has been explored through drilling, but no production has been reported. Mast and others (1998) gives details on map construction.

*Mast, R.F., Root, D.H., Williams, L.P., Beeman, W.R., and Barnett, D.L., 1998, Areas of historical oil and gas exploration and production in the conterminous United States: U.S. Geological Survey Geologic Investigations Series I-2582, one sheet.

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Graphical Comparison of Reserve-Growth Models for Conventional Oil and Gas Accumulations

By T.R. Klett

Foreword

Reserve growth refers to the increases in estimated sizes (as recoverable volumes of oil and natural gas) of fields that typically occur through time as oil and gas fields are developed and produced. Since the completion of its 1995 National Petroleum Assessment (Gautier and others, 1996), the U.S. Geological Survey (USGS) has undertaken a project to study reserve growth by identifying the range in variation of reserve-growth estimates using various datasets and models. This report analyzes a portion of that variation. The project also seeks to identify the geologic, engineering, economic, and other controls governing the growth of fields through time. The results of this report do not represent official estimates of field growth for the United States, but are simply presented for comparative purposes. Other chapters in this volume provide more detailed descriptions of specific reserve-growth models and controls on reserve growth.

Abstract

The U.S. Geological Survey (USGS) periodically assesses crude oil, natural gas, and natural gas liquids resources of the world. The assessment procedure requires estimated recoverable oil and natural gas volumes (field size, cumulative production plus remaining reserves) in discovered fields. Because initial reserves are typically conservative, subsequent estimates increase through time as these fields are developed and produced. The USGS assessment of petroleum resources makes estimates, or forecasts, of the potential additions to reserves in *discovered* oil and gas fields resulting from field development, and it also estimates the potential fully developed sizes of *undiscovered* fields. The term "reserve growth" refers to the commonly observed upward adjustment of reserve estimates. Because such additions are related to increases in the total size of a field, the USGS uses field sizes to model reserve growth.

Future reserve growth in existing fields is a major component of remaining U.S. oil and natural gas resources and has therefore become a necessary element of U.S. petroleum resource assessments. Past and currently proposed reserve-growth models compared herein aid in the selection of a suitable set of forecast functions to provide an estimate of potential additions to reserves from reserve growth in the ongoing National Oil and Gas Assessment Project (NOGA). Reserve growth is modeled by construction of a curve that represents annual fractional changes of recoverable oil and natural gas volumes (for fields and reservoirs), which provides growth factors. Growth factors are used to calculate forecast functions, which are sets of field- or reservoir-size multipliers.

Comparisons of forecast functions were made based on datasets used to construct the models, field type, modeling method, and length of forecast span. Comparisons were also made between forecast functions based on field-level and reservoir-level growth, and between forecast functions based on older and newer data.

The reserve-growth model used in the 1995 USGS National Assessment and the model currently used in the NOGA project provide forecast functions that yield similar estimates of potential additions to reserves. Both models are based on the Oil and Gas Integrated Field File from the Energy Information Administration (EIA), but different vintages of data (from 1977 through 1991 and 1977 through 1996, respectively). The model based on newer data can be used in place of the previous model, providing similar estimates of potential additions to reserves. Forecast functions for oil fields vary little from those for gas fields in these models; therefore, a single function may be used for both oil and gas fields, like that used in the USGS World Petroleum Assessment 2000.

Forecast functions based on the field-level reserve growth model derived from the NRG Associates databases (from 1982 through 1998) differ from those derived from EIA databases (from 1977 through 1996). However, the difference may not be enough to preclude the use of the forecast functions derived from NRG data in place of the forecast functions derived from EIA data. Should the model derived from NRG data be used, separate forecast functions for oil fields and gas fields must be employed. The forecast function for oil fields from the model derived from NRG data varies significantly from that for gas fields, and a single function for both oil and gas fields may not be appropriate.

Introduction

The U.S. Geological Survey (USGS) periodically assesses oil, natural gas, and natural gas liquids resources of the world. The assessment procedure requires estimated recoverable oil and natural gas volumes (field size, cumulative production plus remaining reserves) in discovered fields. However, initial reserve estimates are typically conservative, and subsequent estimates of field size generally increase through time as fields are developed and produced. These estimates change through time for a variety of geologic, engineering, operational, and economic reasons, such as (1) delineation of additional in-place oil and natural gas, (2) increase in recovery efficiency, and (3) recalculation of viable reserves in dynamically changing economic and operating conditions.

Changes in reserve estimates must be accounted for in any assessment of future petroleum resources. As part of the USGS

assessment of petroleum resources, forecasts are made for *discovered* oil and gas fields of the potential additions to reported reserves resulting from field development. Additionally, forecasts of the potential fully developed sizes of *undiscovered* fields are made. The term “reserve growth” as used here, which is synonymous with “field growth,” “reserve appreciation,” “ultimate recovery appreciation,” among others, refers to the commonly observed upward adjustment of field-size estimates due to reserve additions.

The USGS has developed several mathematical methods to model annual additions to oil and natural gas reserves (reserve growth). Because such additions are related to increases in the total size of a field, the USGS uses field sizes to model reserve growth. The models are based on extrapolations from historical records of conventional oil and gas fields located onshore and in State waters of the conterminous United States. Collectively, the successive annual estimates of sizes of these fields typically increase through time, even though the changes of individual field sizes are extremely variable. The models use past annual volumetric changes of fields that have been grouped by field age (as years since discovery).

The models involve sets of annual growth factors (typically as annual fractional changes) for fields of similar ages that are mathematically derived from the historical field-size data. Cumulative products of annual growth factors yield multipliers used to calculate future field sizes from current known field sizes and, thus, additions to reserves. In addition, sets of multipliers providing forecasts for specified time frames can be expressed as forecast functions, which are used for comparing the reserve-growth models with one another in this report.

Past and currently proposed reserve-growth models are compared in this report to aid in the selection of suitable forecast functions for use in the ongoing National Oil and Gas Assessment (NOGA) Project. Comparisons of forecast functions were made based on datasets used to construct the models, field type, modeling method, and length of forecast span. Comparisons were also made between forecast functions based on field-level and reservoir-level growth, and between forecast functions based on older and newer data.

Background

Petroleum is used in this report as a collective term for crude oil, natural gas, and natural gas liquids. The USGS identifies two major types of petroleum accumulations based on geology, conventional and continuous. Conventional accumulations are associated with structural or stratigraphic traps, commonly bounded by a down-dip water contact, and therefore affected by the buoyancy of petroleum in water (Schmoker, 1996; Schmoker, 1999b). Continuous accumulations are areally extensive reservoirs of petroleum not necessarily related to conventional structural or stratigraphic traps. These accumulations lack well-defined down-dip petroleum/water contacts, and thus are not localized by the buoyancy of oil or natural gas in water (Schmoker, 1996; Schmoker, 1999b). Examples of continuous accumulations include “tight gas reservoirs,” coalbed gas, oil and gas in shale, oil and gas in chalk, basin-centered gas, and

shallow biogenic gas. These geologic definitions for both types of accumulations do not involve factors such as water depth, regulatory status, or engineering techniques (Schmoker, 1996; Schmoker, 1999b).

Because of the geologic differences, continuous accumulations exhibit fundamentally different reserve-growth patterns. A conventional field consists primarily of discrete conventional oil and natural gas accumulations, which can be added or enhanced to increase petroleum reserves. In contrast, continuous accumulations may be treated as a collection of petroleum-containing cells for assessment purposes, virtually all of which are capable of producing some oil or gas, but which vary significantly in their production (and thus economic) characteristics (Schmoker, 1999b). The USGS has developed a specific model to estimate the potential additions to reserves of continuous accumulations, called FORSPAN (Schmoker, 1999b). The present report, however, describes reserve-growth models used to estimate potential additions to reserves of only conventional accumulations.

According to the Society of Petroleum Engineers and World Petroleum Congresses (1997), changes in reserve estimates occur with the addition of geologic or engineering data, and with changing economic conditions. Thus it is convenient to describe reserve growth in terms of geology, engineering practices, and economics. With respect to geology, reserve growth occurs by the delineation and addition of in-place oil and gas volumes. When a new field is discovered, the known extent of the proven reservoir is estimated. As the field is developed, in-place volumes increase with the addition of new reservoirs, pools, or pay zones, and by extension of the proven reservoir area. In-place volumes also increase by new completions of bypassed zones. Improved engineering practices can increase recovery percentage, which also increases reserves. Such practices include drilling of infill wells, well stimulation, well re-completions, and improved recovery programs. Reserves may also increase upon revision due to changing economic conditions, specifically, price-to-cost ratio. Activities that promote a reduction in cost or risk, such as reevaluation of production performance and more efficient operational procedures, can result in increasing reserve estimates.

Many published reports describe or address reserve growth in the U.S., including Arrington (1960), Hubbert (1967), Marsh (1971), Pelto (1973), Mast and Dingler (1975), White and others (1975), Root (1981), Lewis (1986), Mast and others (1989), Megill (1989a, b, c, d; 1990), Energy Information Administration (1990), Drew and Lore (1992), Drew and Schuenemeyer (1992), National Petroleum Council (1992), Root and Attanasi (1993), Root and Mast (1993), Attanasi and Root (1994), U.S. Geological Survey National Oil and Gas Resource Assessment Team (1995), Gautier and others (1996), Schmoker and Attanasi (1996), Lore and others (1996), Oil & Gas Journal (1996), Grace (1997), Hatcher and Tussing (1997), Houseknecht (1997), Morehouse (1997), Root and others (1997), Schmoker and Attanasi (1997), Attanasi and others (1999), Schmoker (1999a), Attanasi (2000), Schmoker (2000), Verma (2000), Schmoker and Klett (2000), Attanasi (2001), and Lore and others (2001). Methods proposed in many of these studies to forecast reserve growth are based primarily on empirical projections of past reserve-growth patterns (Schmoker and

Attanasi, 1996); few other methods for forecasting reserve growth have been proposed. These published methods contain several limitations, however, including:

- Historical reserve-growth patterns, observed among the available datasets used to model reserve growth, are assumed to remain the same in the future.
- The volumetric changes of individual or small groups of fields through time are extremely variable; therefore, large groups of fields must be analyzed collectively to provide statistically significant results.
- Reserve growth is assumed to start in the year a field was discovered and ignores the effects of postponed or delayed field development.
- Physical mechanisms affecting reserve growth are not considered, such as the historical time period at which a field is developed, the initial estimated size of a field (larger fields may be more prone for development investment), size of the operator (larger companies have more money to invest than smaller companies), availability of infrastructure, type and quality of oil and natural gas (oil fields may be more fully developed than gas fields, or fields containing lighter oil are more developed than those containing heavier oil), and physical conditions (reservoir heterogeneity, reservoir depth, temperature, and pressure).

Although a few initial studies have been made (Drew, 1997), additional models should be developed based on the physical mechanisms (geology and engineering practices) and economics responsible for reserve growth rather than general empirical projections. These models may be used to estimate reserve growth of smaller populations of fields having similar geologic, engineering, or economic characteristics. The relative importance of reservoir properties, trapping mechanisms, oil and gas characteristics, and other geological factors, oil and gas recoverability, commodity price, drilling activity, development of new technologies, and development of infrastructure, such as platforms and pipelines, must be identified to fully characterize and quantify the controls on reserve growth. Such studies can best be done in those few areas of the world where development is advanced and fields, resources, technology, and data are abundant.

Terms and Definitions

Selected terms of particular importance to this study are defined here.

Accumulation. One or more reservoirs of petroleum that have distinct trap, charge, and reservoir characteristics. For purposes of assessment, an accumulation is treated as a single entity. An accumulation may encompass several fields or equate to a single field or reservoir; conversely, a field may equate to one or to several accumulations. Two major types of petroleum accumulations based on geology are recognized, conventional and continuous.

Annual Fractional Change. The ratio of recoverable oil or gas volumes reported from one year to the next. As used in this study, the annual fractional change is expressed as $AFC_t = V_{t+1}/V_t$, where AFC_t is the annual fractional change at year t and V is recoverable volume. Some types of growth

functions and annual growth factors are derived directly from annual fractional changes.

Annual Growth Factor. A factor that represents the change in recoverable oil or gas volumes reported from one year to the next, expressed as $AGF_{j,t} = V_{t+1}/V_t$, where AGF_j is the annual growth factor and V is the recoverable oil or natural gas volume reported for fields of a given age j in years t and $t+1$ (compare with annual fractional change). The field age in number of years since discovery is the year for which the recoverable volume is reported minus the field-discovery year plus 1. Annual growth factors may equate to annual fractional changes.

Annual Growth Function. A curve defined to represent annual volumetric changes (fractional or absolute) in oil and natural gas volumes for fields of similar age.

Conventional (Field and Reservoir). Fields and reservoirs that are associated with structural or stratigraphic traps, commonly bounded by a down-dip water contact, and therefore affected by the buoyancy of petroleum in water.

Cumulative Growth Function. A curve that represents the cumulative product of modeled annual volumetric changes (growth factors).

Discovery Table. A table of recoverable petroleum volumes reported for consecutive years of estimates of oil or gas fields, grouped by discovery year or field age.

Factors. Point estimates constituting a growth function, that represent modeled annual volumetric changes (fractional or absolute) of oil and gas fields grouped by field age.

Field. An area consisting of a single reservoir or multiple reservoirs of petroleum, all grouped on, or related to, a single geologic structural and (or) stratigraphic feature. Individual reservoirs in a single field may be separated vertically by impervious strata or laterally by local geologic barriers. When projected to the surface, the reservoir(s) within the field can form an approximately contiguous area that may be circumscribed.

Field Age. Age of the field, in years, since discovery.

Field Size. The recoverable volume of oil, natural gas, and natural gas liquids contained in a field; equals cumulative production plus remaining reserves.

Forecast Function. A function that represents individual multipliers for fields of similar ages, used to provide estimates of potential reserve growth within a specified forecast span.

Forecast Span. A specified future time span during which petroleum accumulations have the potential to provide additions to reserves. A forecast span affects (1) the minimum assessed undiscovered accumulation size, (2) the number of years in the future that reserve growth is estimated, (3) economic assessments, (4) the accumulations that are chosen to be considered, and (5) the risking structure as represented by access risk.

Function. A curve that represents annual or cumulative changes in reported recoverable oil and natural gas volumes. A function consists of a set of factors or multipliers, one for each set of fields of similar age.

Gas Field. A field whereby the recoverable petroleum has a gas-to-oil ratio (GOR) of 20,000 cubic feet of gas/barrel of oil or greater.

Known Field Size. The reported recoverable volume (cumulative production plus remaining reserves) of a field of the major petroleum commodity. The known field size of an oil field is typically given in terms of the recoverable volume of oil, whereas the known field size of a gas field is typically given in terms of recoverable volume of natural gas.

Method. A procedure by which reserve growth is modeled.

Model. A quantified pattern of past reserve growth used to forecast future reserve growth of existing discovered fields. A model consists of a dataset, a curve or function that represents a set of annual growth factors constructed from the dataset, and forecast functions derived from the annual growth factors.

Monotonic Constraint. A condition imposed on a growth function in which the amount of reserve growth of older fields will not exceed the reserve growth of younger fields. The resulting model therefore employs a monotonous, continuous function (Attanasi and Root, 1994; Attanasi, 2001).

Multipliers. Factors that, when multiplied by recoverable volumes of fields, provide estimates of potential reserve growth for fields of a given age and for a specified forecast span.

Oil Field. A field whereby the recoverable petroleum has a gas-to-oil ratio (GOR) less than 20,000 cubic feet of gas/barrel of oil.

Recoverable Volumes. The sum of cumulative production and remaining reserves as reported in the databases used in support of the assessment; synonymous with "field size."

Remaining Reserves. Volume of petroleum, in discovered accumulations, that has not yet been produced. Remaining reserves are classified as either as proved or proved plus probable. The classification, proved plus probable plus possible, is not used in this study. Remaining reserves reported for U.S. fields are typically proved reserves. Remaining reserves reported for fields in countries other than the U.S. are typically proved plus probable reserves.

Reserves. The estimated quantities of petroleum expected to be commercially recovered from known accumulations relative to a specified date, under prevailing economic conditions, operating practices, and government regulations (modified from Society of Petroleum Engineers and World Petroleum Congresses, 1997). Reserves are part of the identified (discovered) resources and include only recoverable petroleum. Reserve estimates are uncertain, and reserves are classified as (1) proved, (2) proved plus probable, and (3) proved plus probable plus possible, based on this uncertainty.

Datasets

The following are informal names and summaries of the datasets that were used to construct reserve-growth models used in this study. The datasets were constructed using field- and reservoir-size data from consecutive annual versions or vintages of proprietary government and commercial databases (the databases are given in References Cited). The datasets include only

conventional fields or reservoirs that are located onshore or in State waters of the Lower 48 United States.

Energy Information Administration (1977 through 1991):

Unpublished dataset constructed from field data collected annually by the Energy Information Administration (EIA) and maintained in the database called the "Oil and Gas Integrated Field File" (OGIFF). The dataset contains recoverable volumes for all fields (no lower field-size limit) that were estimated annually from 1977 through 1991. These data are derived from Form EIA-23 survey data and public State and Federal production data obtained through Petroleum Information/Dwights LLC (Englewood, Colo., available from IHS Energy Group, 15 Inverness Way East, D205, Englewood, CO 80112, U.S.A.) (Morehouse, 1997). The EIA data are proprietary and not available to the public.

Energy Information Administration (1977 through 1996):

Dataset constructed from field data reported in the OIGIFF database. The dataset contains recoverable volumes for all fields (no lower field-size limit) that were estimated annually from 1977 through 1996. These data are proprietary and not available to the public.

NRG Associates Fields (1982 through 1998): Dataset constructed from field data collected annually and maintained in the database called, "Significant Oil and Gas Fields of the U.S." by NRG Associates (2000). The dataset contains annual estimates of recoverable volumes for fields of 1 million barrels of oil equivalent (MMBOE) or greater, from 1982 through 1998. These data are commercially available.

NRG Associates Reservoirs (1982 through 1998): Dataset constructed from reservoir data reported in the Significant Oil and Gas Fields of the U.S. database. The dataset contains recoverable volumes for reservoirs in fields of 1 million barrels of oil equivalent (MMBOE) or greater, estimated annually from 1982 through 1998. These data are commercially available.

Reserve-Growth Models

Patterns of past reserve growth form a rationale for modeling patterns of future reserve growth (Lore and others, 1996; Schmoker and Klett, 2000). To model reserve growth usually requires datasets of successive yearly field-size (or reservoir-size) estimates (as recoverable volumes of oil or natural gas). The changes in sizes of individual oil and gas fields through time are extremely variable. However, successive annual estimates of oil and natural gas volumes contained in groups of fields typically increase collectively, and the annual increases in these fields, grouped by age, are used for modeling.

Mathematical models of potential reserve growth in the U.S. developed by the USGS require good-quality historical data on reserves or field sizes, such as those available from the EIA and vendors such as NRG Associates (1999) (Schmoker and Klett, 2000; for examples, see Attanasi and Root, 1994; Root and others, 1997; Schmoker and Crovelli, 1998).

Operators of significant oil and gas fields in the United States are required to report annually to the EIA the total production from most of their fields and to provide an estimate of proved reserves. Recoverable oil and natural gas volumes are therefore reported in a consistent manner throughout the U.S. (Schmoker and Klett, 2000). These reports constitute the information from which various databases are constructed (Schmoker and Klett, 2000). Fields that have been abandoned are included in the dataset. The last reported recoverable volumes for abandoned fields, however, are maintained in subsequent vintages of the database.

Annual growth functions (curves that represent modeled annual fractional change) can be constructed from annual estimates of recoverable oil and natural gas volumes contained in groups of fields of the same age. The USGS constructs annual growth functions using a least-squares analysis of annual volumetric changes in recoverable volumes (Attanasi and Root, 1994). These annual growth functions are referenced to the age of the fields and constructed for oil in oil fields and gas in gas fields. Field age, in this study, serves as a measure of field-development effort (infill drilling, improved recovery operations, well stimulation, pressure maintenance, equipment improvement, and so on) that is applied to promote reserve growth (Schmoker and Klett, 2000). Because much of the field development typically occurs upon initial production (at some time later than the field discovery date), field age referenced to the date of first production may provide a more appropriate measure of development. However, the dates of first production are not reported in the currently used datasets.

The procedure for compiling annual volumetric data, in order to construct an annual growth function, is illustrated by four steps in figure 1. First, a time series (spanning 10 or more years) of reliable annual estimates of recoverable oil or natural gas volumes is obtained from one of the datasets. These volumes are then arranged into age classes according to field discovery year and summed. The resulting table is called a discovery table. (Discovery tables constructed from the Energy Information Administration (1977 through 1996), NRG Associates Fields (1982 through 1998), and NRG Associates Reservoirs (1982 through 1998) datasets are provided in tables 1–6.) Third, the annual growth factors representing annual fractional changes of the petroleum volumes in each age class are calculated. The annual growth factors can be derived by many different methods, including calculating the mean or weighted mean of the annual fractional changes (as described by Arrington, 1960, for example), applying a least-squares method (as described by Attanasi and Root, 1994, for example), and so on. Finally, annual fractional changes are rearranged into “years-since-discovery” categories. For some models, volumes in the discovery table, rather than annual fractional changes, are rearranged in terms of years since discovery (Attanasi and Root, 1994; Attanasi, 2001; E.D. Attanasi, oral commun., 2002).

The graph shown in figure 2 was based on 20 consecutive years of data (Energy Information Administration, 1977 through 1996), from which 19 annual fractional change factors were calculated for each field type (oil and natural gas). Therefore, 19

points representing oil fields (green) and 19 points representing gas fields (red) are plotted for each field age as years-since-discovery, except fields of 80 years or older with respect to the most recent database vintage (the oldest 19 years-since-discovery dates), reflecting the changes in ages of the oldest fields through time between 1977 and 1996 (fig. 1, panel 4). Fields discovered before 1898 were not included in any of the datasets. In 1977, therefore, no fields older than 79 years were reported; likewise, in 1978, no fields older than 80 years were reported, and so on.

Figures 2 and 3 also show extreme variability in the factors, even on the scale of all conterminous U.S. fields. Models constructed from smaller datasets may have a lower confidence due to increased variance in the dataset (fig. 3). The reserve-growth function shown in figures 2, 3, and 4 (U.S. Lower 48 Mean—1991 model) is described later.

Historical reserve-growth patterns observed in the datasets used to model reserve growth are dependent upon the prevailing technology and economic conditions and therefore have not always been consistent through time. The set of graphs in figure 4 shows the changes in growth patterns through time. The graphs show that during the time span of the available datasets, growth patterns in oil fields may be more dependent upon prevailing technological and economic conditions than those for gas fields. Conversely, prevailing conditions for gas fields may not have varied as much as those for oil fields.

Several published and unpublished reserve-growth models based on the annual estimates of recoverable petroleum volumes of U.S. (Lower 48 States) and Federal Offshore Gulf of Mexico conventional oil and gas fields are used in this study, as follows:

Arrington Model—1996: This model was developed for this study based on the annual fractional changes of recoverable oil and natural gas volumes reported in the Energy Information Administration (1977 through 1996) dataset and calculated using the method described by Arrington (1960). This model differs from the original model described by Arrington (1960) in that only annual fractional changes are used to forecast reserve growth, rather than a smoothed curve fit through 3-year weighted averages of these changes. One set of forecast functions (for 30-year and 80-year forecasts) was constructed for oil fields and another for gas fields.

Mean of U.S. Lower 48 Annual Growth Factors—1996: This model was developed from data used in this study based on calculating the mean of the annual fractional changes of recoverable oil and natural gas volumes reported in the Energy Information Administration (1977 through 1996) dataset. One set of forecast functions (for 30-year and 80-year forecasts) was constructed for oil fields and another for gas fields.

MMS Federal Offshore—1996: Lore and others (1996) developed this model based on calculating annual growth coefficients from the MMS (Minerals Management Service) Field and Reservoir Reserves Estimates dataset from 1975 onward (dataset not used in this study), and then applying regression analysis to these coefficients (E.D. Attanasi, written commun., 2001) (Drew and Lore, 1992; Lore and others, 1996). The dataset includes only oil and gas fields

1. Obtain Time Series of Field-Size Estimates

FIELD	DISC. YEAR	VOLUMES PER DATABASE VINTAGE					
		1995	1996	1997	1998	1999	2000
Field 1	1993	5	5	5	6	6	6
Field 2	1997			10	11	13	15
Field 3	1993	25	25	25	25	27	27
Field 4	1968	100	100	100	100	100	100
Field 5	1975	75	75	70	70	71	71
<i>CONTINUED</i>							

3. Calculate Annual Growth Factors (AGF)

DISC. YEAR	ANNUAL FRACTIONAL CHANGES IN VOLUMES				
	1996/1995	1997/1996	1998/1997	1999/1998	2000/1999
1995	0.99682	1.00255	1.00763	1.00505	1.00377
1996		1.02000	1.00784	1.01946	1.00382
1997			1.01852	1.01818	1.01786
1998				1.02143	1.03497
1999					1.09524
2000					

2. Arrange Volumes Into Age Classes and Sum (Discovery Table)

DISC. YEAR	VOLUMES PER DATABASE VINTAGE					
	1995	1996	1997	1998	1999	2000
1995	7865	7840	7860	7920	7960	7990
1996		6250	6375	6425	6550	6575
1997			5400	5500	5600	5700
1998				3500	3575	3700
1999					2100	2300
2000						1600

4. Arrange AGF's Into Years Since Discovery

YEARS SINCE DISC.	ANNUAL FRACTIONAL CHANGES IN VOLUMES				
	1996/1995	1997/1996	1998/1997	1999/1998	2000/1999
4	1.00377
3	1.00505	1.00382
2	1.00763	1.01946	1.01786
1	1.00255	1.00784	1.01818	1.03497
0	0.99682	1.02000	1.01852	1.02143	1.09524

Figure 1. Procedure for compiling annual volumetric data for reserve-growth models (synthetic data are used in this example), to be followed in sequence from panel 1 through panel 4. DISC. YEAR is discovery year. Leaders (....), not applicable; blank, no data.

ANNUAL FRACTIONAL CHANGES (GROWTH FACTORS) WITH RESPECT TO
FIELD AGE OF CONVENTIONAL OIL AND GAS FIELDS, LOWER 48 UNITED STATES

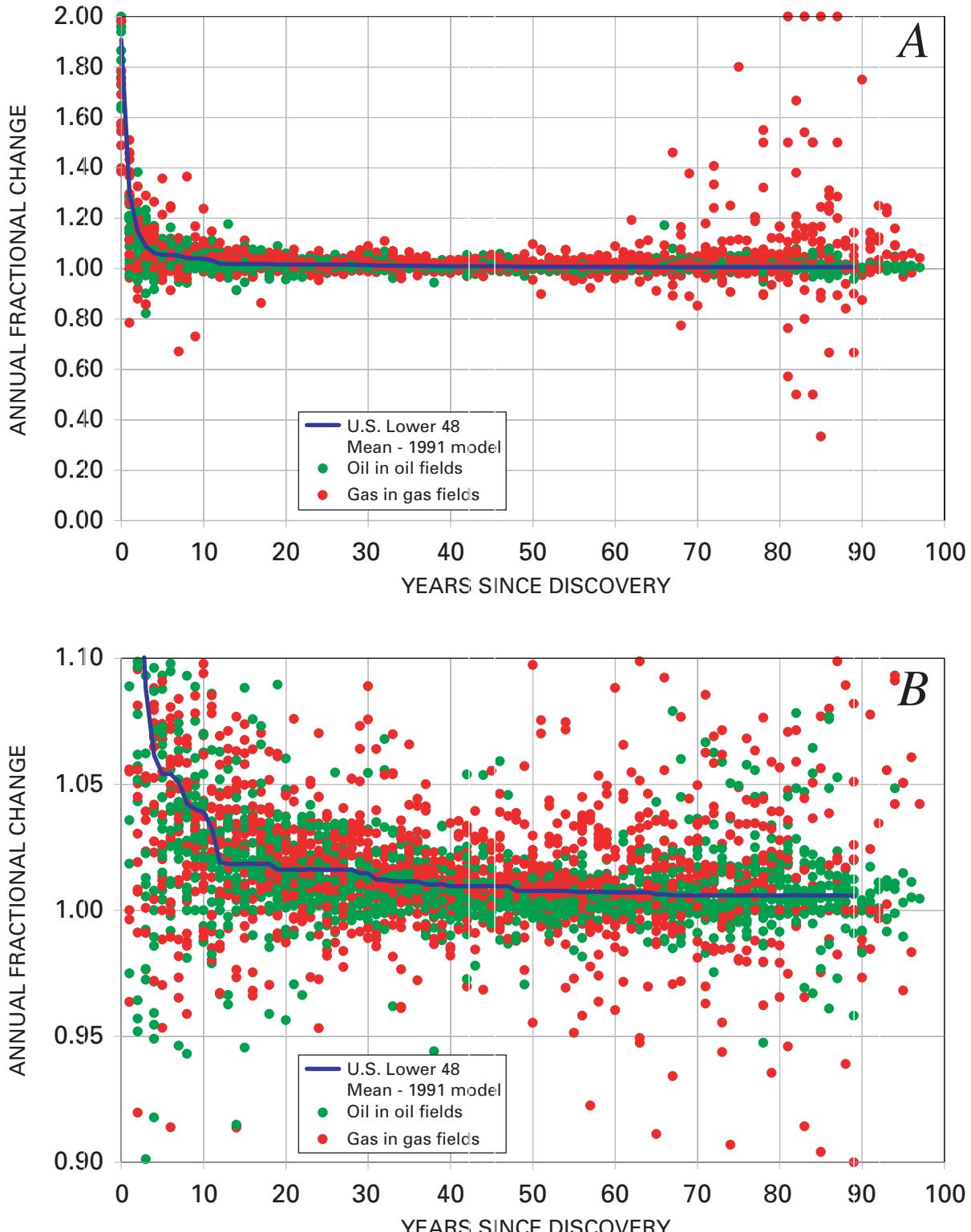


Figure 2. Annual fractional changes of recoverable oil and natural gas. This graph (*A*) was based on 20 consecutive years of data (Energy Information Administration, 1977 through 1996), from which 19 annual fractional change factors were calculated for each field type (oil and gas). Therefore, 19 points representing oil fields (green) and 19 points representing gas fields (red) are plotted for each year-since-discovery. A reserve-growth model (blue line) derived from an older dataset and representing the mean of the individual annual growth factors (Schmoker and Klett, 2000) is shown for reference. *B*, expanded scale.

CENTRAL TENDENCIES IN ANNUAL FRACTIONAL CHANGES

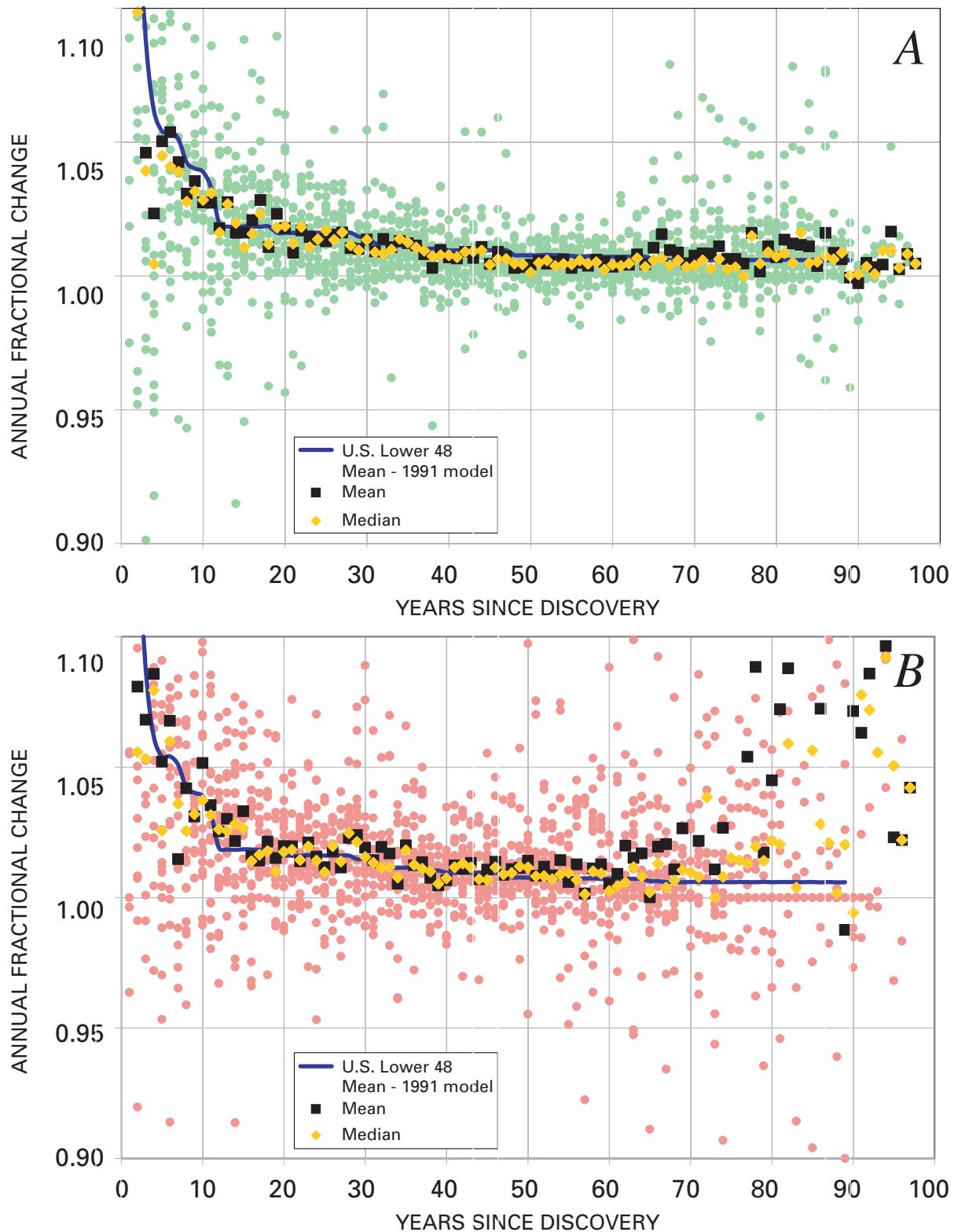


Figure 3. Annual fractional changes of recoverable oil and natural gas volumes from the Energy Information Administration (1977 through 1991) dataset with the mean and median values of these data. The U.S. Lower 48 Mean—1991 model (curve; described in fig. 2) is shown for comparison. The mean values deviate significantly for very young and very old field ages. *A*, oil in oil fields; *B*, gas in gas fields.

located in Federal Offshore waters of the U.S. portion of the Gulf of Mexico. One set of forecast functions (for 30-year and 80-year forecasts) was constructed that is applicable to both oil fields and gas fields. For comparative purposes in this study, the annual growth factors for the MMS Federal Offshore (1996) model were adjusted to start at 0 rather than 1 year-since-discovery. This adjustment did not significantly affect the forecast functions and multipliers derived from this model.

NRG U.S. Lower 48 Fields Monotone—1998: E.D. Attanasi (written commun., 2001) developed this model based on a least-squares fit, having a monotonic constraint to annual fractional changes of recoverable oil and natural gas volumes reported in the NRG Associates (1982 through 1998) dataset. One set of forecast functions (for 30-year and 80-year forecasts) was constructed for oil fields and another for gas fields.

NRG U.S. Lower 48 Reservoirs Monotone—1998: E.D. Attanasi (written commun., 2001) developed this model based on a least-squares fit, having a monotonic constraint to annual fractional changes of recoverable oil and natural gas volumes in reservoirs reported in the NRG Associates (1982 through 1998) dataset. One set of forecast functions (for 30-year and 80-year forecasts) was constructed for oil accumulations and another for gas accumulations.

U.S. Lower 48 Mean—1991: Schmoker and Klett (2000) developed this model based on Energy Information Administration (1977 through 1991) dataset. One set of forecast functions (for 30-year and 80-year forecasts) applicable to both oil fields and gas fields was constructed by calculating the mean of the annual oil-field and gas-field factors derived from the U.S. Lower 48 Monotone (1991) model.

U.S. Lower 48 Monotone—1991: Root and others (1997) developed this model based on a least-squares fit, having a monotonic constraint to annual fractional changes of recoverable oil and natural gas volumes reported in the Energy Information Administration (1977 through 1991) dataset (Root and others, 1997). One set of forecast functions (for 30-year and 80-year forecasts) was constructed for oil fields and another for gas fields.

U.S. Lower 48 Monotone—1996: E.D. Attanasi (written commun., 2001) developed this model based on a least-squares fit, having a monotonic constraint to annual fractional changes of recoverable oil and natural gas volumes reported in the Energy Information Administration (1977 through 1996) dataset. One set of forecast functions (for 30-year and 80-year forecasts) was constructed for oil fields and another for gas fields.

Annual growth factors are derived from calculations or curve fits using the annual fractional changes in recoverable volumes and represent modeled annual fractional changes. Annual growth factors provide 1-year forward forecasts, represented by

$$AGF_{j,t} = V_{t+1}/V_t \quad (1)$$

where AGF is the annual growth factor and V is the recoverable oil or natural gas volume reported for fields of a given age j in

years t and $t+1$. The field age in number of years since discovery is the year for which the recoverable volume is reported minus the field-discovery year plus 1. In figure 1, the report year is 2000. The annual growth factor for fields discovered in 2000 cannot be calculated because the recoverable volumes for 2001 have not yet been reported (fig. 1, panel 3). The age of fields discovered in 1999 is zero rather than 1 because reserve growth is assumed to occur between the date of discovery and the first full year of existence, and many of the fields may not be fully 1 year old at the time the new data are reported (fig. 1, panel 4). The annual fractional change for fields discovered in 1999 until year one (0 years since discovery) is the fractional change between the volumes reported in 2000 and those reported in 1999, as

$$AGF_{0,1999} = V_{2000}/V_{1999} \quad (2)$$

Likewise, fields discovered in 1998 would have an age of 1 year with respect to the annual growth factor based on 2000 data, and 0 age with respect to the annual growth factor based on 1999 data:

$$AGF_{1,1999} = V_{2000}/V_{1999} \quad (3)$$

and

$$AGF_{0,1998} = V_{1999}/V_{1998} \quad (4)$$

Despite the method of construction, annual growth functions may be expressed as sets of discrete factors of annual change, one factor for each field age. A forecast function is derived from the products of annual growth factors for a given forecast span for each field age (the USGS currently uses a 30-year forecast span). This procedure is analogous to the calculation of compounding interest,

$$v_{fn} = v_{in} (1+i)^n \quad (5)$$

where v_{fn} is the final value, v_{in} is the initial value, i is the interest rate expressed as a decimal, and n the number of compounding periods. Unlike interest at a fixed rate, however, the amount of reserve growth (the reserve growth “interest rate”) is not constant, but rather is a variable dependent on the compounding periods. Therefore, equation (5) is slightly modified so that

$$V_{fn} = V_{in} (1+i_1) (1+i_2) (1+i_3) \dots (1+i_n) \quad (6)$$

where V_{fn} is the final recoverable volume, V_{in} is the initial recoverable volume, i is the annual fractional change, and n is the number of years of the forecast span (30 years and 80 years for this study). The annual growth multiplier m_{j+k} replaces the $(1+i_k)$ terms, where k equals 0 to $n-1$, and the forecast function for a field j years old becomes

$$F_{j,n} = (m_{j+0}) (m_{j+1}) (m_{j+2}) (m_{j+3}) \dots (m_{j+n-1}) \quad (7)$$

where $F_{j,n}$ is the forecast multiplier for a field j years old and a forecast span of n years; m_{j+3} , for example, is the annual growth multiplier for the third year beyond the field age j . Note that decreases in reserves in one or more years can also be

CHANGES IN RESERVE GROWTH (AS ANNUAL FRACTIONAL CHANGE) THROUGH TIME

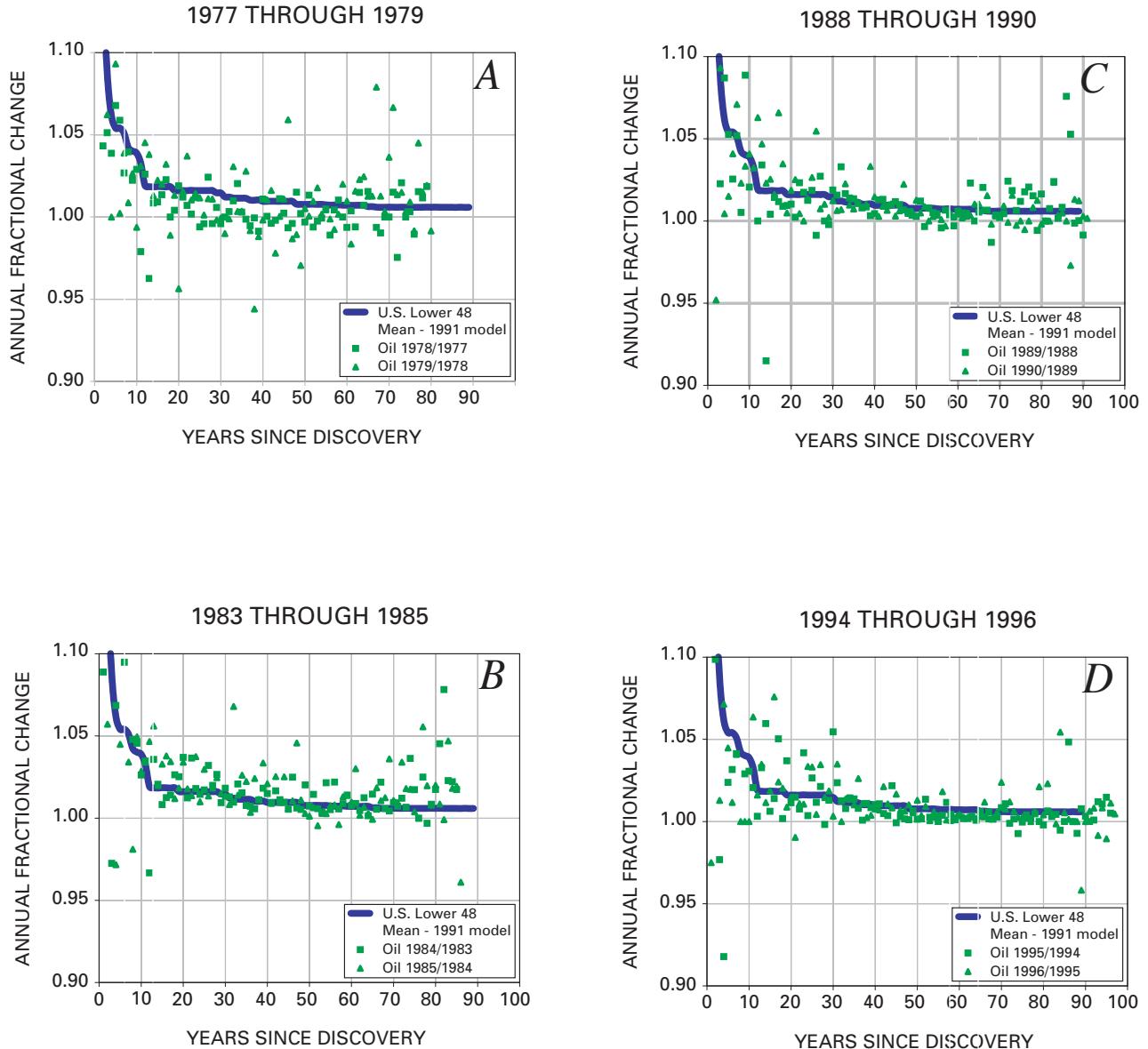


Figure 4 (above and following page). Dependency of reserve growth on existing technology and economic conditions. Relative changes in reserve growth as annual fractional changes (from the Energy Information Administration, 1977 through 1996 dataset) are referenced to the U.S Lower 48 Mean—1991 model. A–D, Oil in oil fields, annual fractional changes between years shown in explanation for each view. E–H, Gas in gas fields, annual fractional changes between years shown in explanation for each view.

accommodated. In those cases, m_{j+k} for those years of reserve decreases would be <1 . Plots of $F_{j, 30}$ and $F_{j, 80}$ are shown in figures 5 through 10, and values given in tables 7–14.

The forecast multipliers may also be calculated from the cumulative growth factors. The cumulative growth factor, CGF , is defined as

$$CGF_l = (m_0)(m_1)(m_2)\dots(m_{l-1}) \quad (8)$$

and can be considered a running product of the annual fractional change until a specified years-since-discovery (field age) of l . Cumulative growth factors are also referenced to provide a

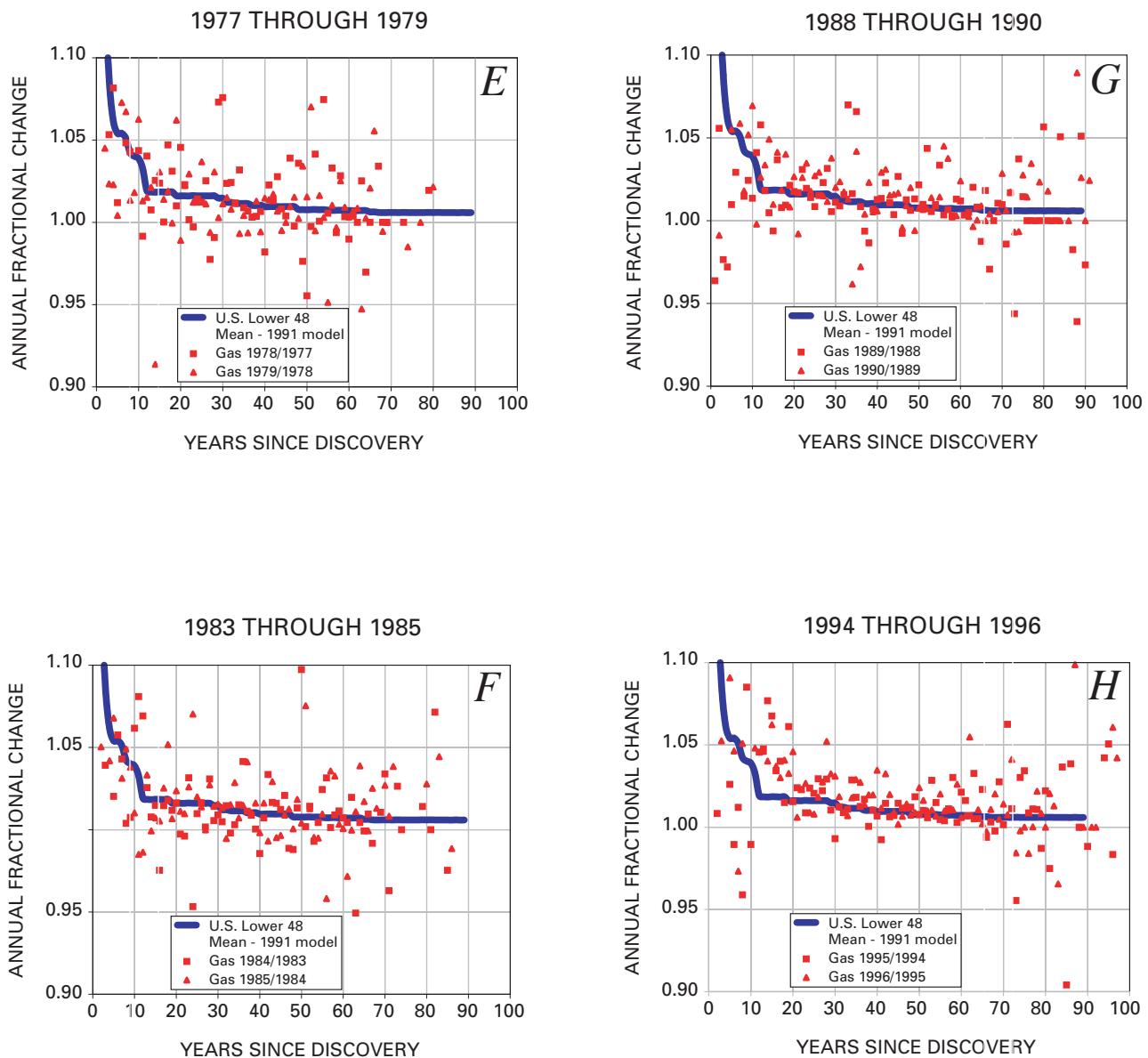
1-year forward forecast, but are designed so that newly discovered fields do not show any cumulative change in volume until they are at least 1 year old. Therefore, the cumulative growth factor for 0 years since discovery had been set to 1.

The forecast multipliers are obtained by dividing the cumulative growth factor for any given field age into the factor for the field age plus the number of years as specified by the forecast span,

$$F_{j, n} = CGF_{j+n}/CGF_j \quad (9)$$

where $F_{j, n}$ is the forecast multiplier for field age j and forecast span n ; CGF is cumulative growth factor (equation 8). Both

CHANGES IN RESERVE GROWTH (AS ANNUAL FRACTIONAL CHANGE) THROUGH TIME



methods for calculating the forecast function factors yield the same result.

Reserve-Growth Forecast Functions

The forecast function consists of a set of factors or multipliers, one for each field age (tables 7–14). Forecasted field sizes (“grown”), after reserve growth for the given forecast span had been applied, are calculated by multiplying the currently reported sizes of fields by each of the multipliers in the set. The forecasted additions to reserves are obtained by calculating the difference between the “grown” field sizes and the current field sizes.

Concave-downward curved line segments are observed in the forecast functions derived from the monotonically

constrained regression models (figs. 5–10). These curved segments represent a mathematical consequence of calculating products (see equation 6) that include sets of annual fractional changes that are constant through several consecutive years.

Each of the various reserve-growth forecast functions exhibits an abrupt change in slope starting at 66 and 68 years since discovery (Energy Information Administration, 1977 through 1996, and NRG Associates, 1982 through 1998 datasets) in 30-year forecast functions and 16 and 18 years since discovery in 80-year forecast functions. This slope break is related to the lack of data for fields older than about 95 years. The forecast functions used in this report are unable to extrapolate reserve growth for fields having ages that are within the number of years of the forecast span from the year of the last data point (for example, fields 65 years old when forecasting 30 years). In order to forecast reserve growth in older fields, the USGS

COMPARISON OF 30-YEAR FORECAST FUNCTIONS DERIVED FROM EIA AND NRG DATASETS

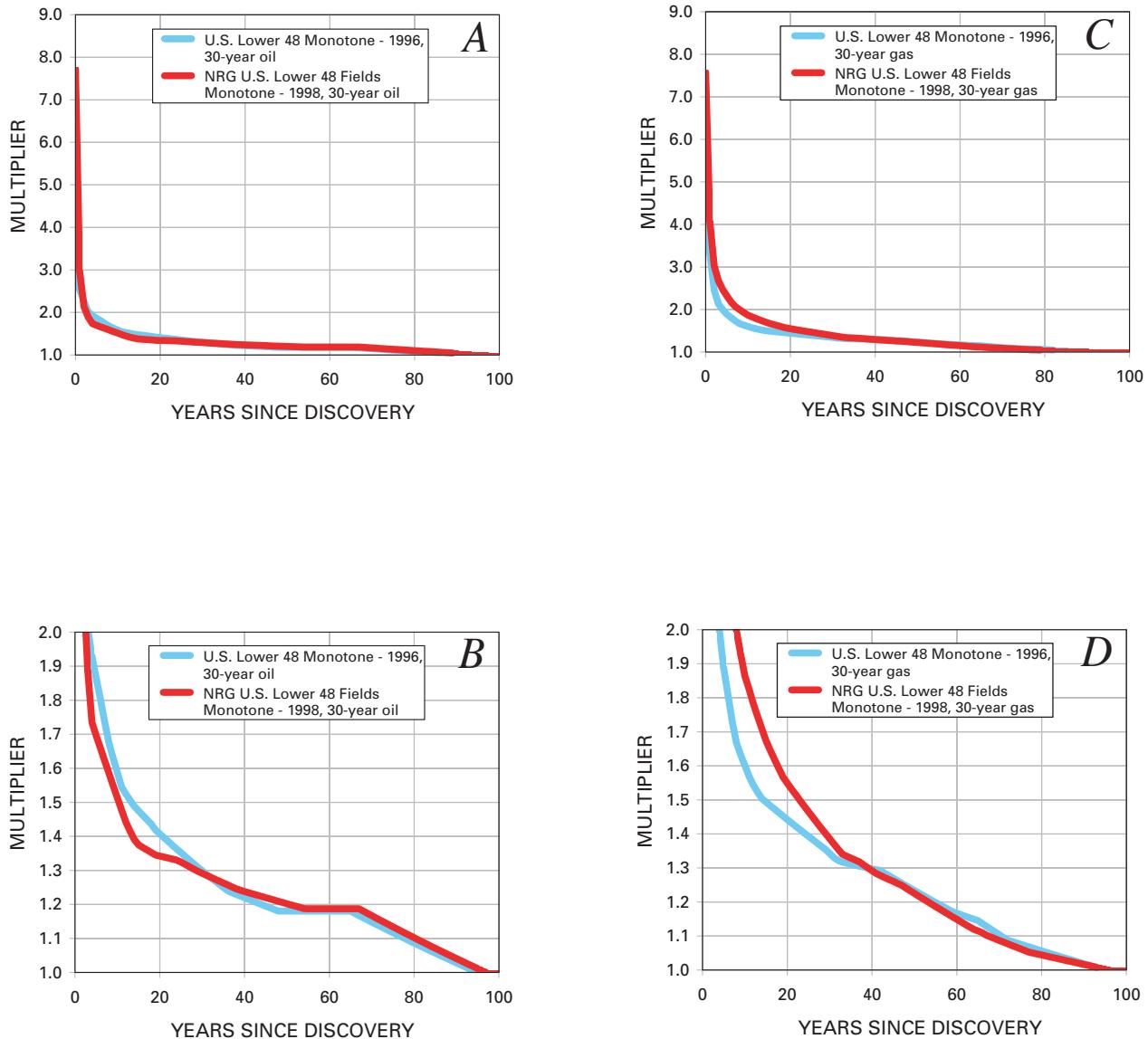


Figure 5. Comparison of forecast functions derived from different datasets (Energy Information Administration, 1977 through 1996, and NRG Associates Fields, 1982 through 1998). *A*, oil fields, 30-year forecast functions; *B*, same as *A*, but with expanded vertical axis; *C*, gas fields, 30-year forecast functions; *D*, same as *C*, but with expanded vertical axis.

models assume that no further growth occurs and annual growth factors are equal to 1. The multipliers for cumulative functions, therefore, remain constant for the data point representing the oldest fields in the dataset and beyond. Because of this conservative approach, forecast functions for those field ages near (by the number of years of the forecast span) or exceeding this point must uniformly decrease to 1 within the functions (see fig. 10 for examples). To model the amount of reserve growth in

older fields for which annual volumetric data are not available remains a topic for further research.

Comparison of Forecast Functions

Reserve-growth forecast functions derived from the models previously described are compared here. The comparison of

reserve-growth forecast functions, unlike that of cumulative functions, allows direct comparisons of individual multipliers. Cumulative functions represent running products of reserve change through time. Because these functions are running products, multipliers for reserves reported for any given vintage cannot be directly compared. A forecast function, however, represents a ratio of the cumulative function (equation 9); therefore, differences among and within the forecast functions through time are more apparent, and differences among factors for various forecast spans can be more readily compared.

The forecast functions compared in this study may be categorized in terms of the methods by which they were constructed. The four primary methods for the development of reserve-growth models and corresponding forecast functions that have been employed in the past include (1) calculation of annual growth factors using the Arrington (1960) method (Arrington Model—1996), (2) calculation of a central tendency of annual growth factors (Mean of U.S. Lower 48 Annual Growth Factors—1996), (3) application of a least-squares method, having a monotonic constraint (NRG U.S. Lower 48 Fields Monotone—1998, NRG U.S. Lower 48 Reservoirs Monotone—1998, U.S. Lower 48 Mean—1991, U.S. Lower 48 Monotone—1991, U.S. Lower 48 Monotone—1996), and (4) application of regression analysis to annual growth factors calculated by the Arrington (1960) method (MMS Federal Offshore—1996).

The USGS reserve-growth models were developed from recoverable oil and natural gas volumes of fields discovered since 1900, that is, field ages 0 to 95 years as reported in the Energy Information Administration (1977 through 1996) dataset or 0 to 97 years as reported in the NRG Associates Fields (1982 through 1998) dataset. The MMS Federal Offshore reserve-growth model is applicable to fields with ages ranging from 0 to 50 years.

The forecast functions used in this study have been calculated to be applicable to fields up to 100 years old by setting the remaining annual growth factors (for fields older than those reported in the datasets) equal to 1, a very conservative assumption that implies no growth beyond the limits of the datasets (see tables 7–14). Annual growth factors of 1 were further extended to field ages of 200 years in order to provide forecasts for spans up to 100 years. (Recall that forecast functions are calculated by taking the product of annual growth factors for the number of years of the forecast span, starting with the field discovery, equation 7.)

In this study, 30-year reserve-growth forecast functions (one for oil fields and one for gas fields), derived from the regression curve having a monotonic constraint, based on the Energy Information Administration (1977 through 1996) dataset, serve as references to which other forecast functions are compared.

Variability among the reserve-growth forecast functions is observed (1) between functions derived from different datasets, (2) between forecast functions for oil fields and forecast functions for gas fields, (3) between functions derived from different construction methods, and (4) between shorter and longer forecast spans. Additionally, variability among the forecast

functions exists due to (5) the approach taken to extrapolate reserve growth for the oldest field ages (field ages beyond the limits of the datasets). An example of this extrapolation difference is shown in figure 9B, whereby two of the forecast functions shown do not consistently decrease with respect to field age as years since discovery.

Reserve-growth forecast functions derived from different datasets using the least-squares fit with monotonic constraint generally do not vary greatly for fields older than about 30 years (multipliers for a given year deviate by about 10 percent or less from one another), but they vary considerably for younger fields (fig. 5). Forecast functions derived from Energy Information Administration (1977 through 1996) and NRG Associates Fields (1982 through 1998) datasets differ between oil fields and gas fields. The NRG-derived function provides smaller multipliers for oil fields younger than about 30 years of age, and slightly larger multipliers for older oil fields (fig. 5A, B). This trend is reversed for gas fields, providing larger multipliers for fields younger than about 40 years of age (fig. 5C, D). The forecast function derived from recoverable oil and natural gas volumes of reservoirs provides smaller values relative to the forecast function derived from fields, for both oil and gas fields of all ages (fig. 6). The forecast functions derived from the older Energy Information Administration (1977 through 1991) dataset and the newer Energy Information Administration (1977 through 1996) dataset vary little from one another (fig. 7).

Forecast functions for oil and gas fields from Energy Information Administration (1977 through 1996) and NRG Associates Fields (1982 through 1998) datasets show similar variations in trends. Compared to gas fields, the functions provide smaller multipliers for oil fields younger than about 55 years of age and larger multipliers for older fields (fig. 8). Multipliers for oil fields and gas fields derived from the Energy Information Administration (1977 through 1996) dataset deviate less than about 10 percent from one another (fig. 8A, B). Multipliers from the NRG Associates Fields (1982 through 1998) dataset vary considerably (several 10's of percent) for fields younger than 30 years of age (fig. 8C, D).

Forecast functions derived from different methods of construction, mentioned earlier, deviate from one another (fig. 9). Thirty-year forecast functions from both the Arrington Model—1996 and the Mean of U.S. Lower 48 Annual Growth Factors—1996 (central tendency) deviate from the Energy Information Administration (1977 through 1996) 30-year function (least-squares method with monotonic constraint) for oil fields, providing smaller multipliers for younger fields and larger multipliers for older fields. The Mean of U.S. Lower 48 Annual Growth Factors—1996 and the Arrington Model—1996, eighty-year forecast functions provide larger multipliers for fields of all ages. The Mean of U.S. Lower 48 Annual Growth Factors—1996 function and the Arrington Model—1996 function vary little from one another.

The 30-year MMS Federal Offshore—1996 forecast function derived from fields of Federal Offshore waters (Lore and others, 1996) differs from the other functions by providing much greater multipliers for younger fields and much smaller

COMPARISON OF 30- AND 80-YEAR FORECAST FUNCTIONS FOR OIL FIELDS AND RESERVOIRS DERIVED FROM NRG DATASETS

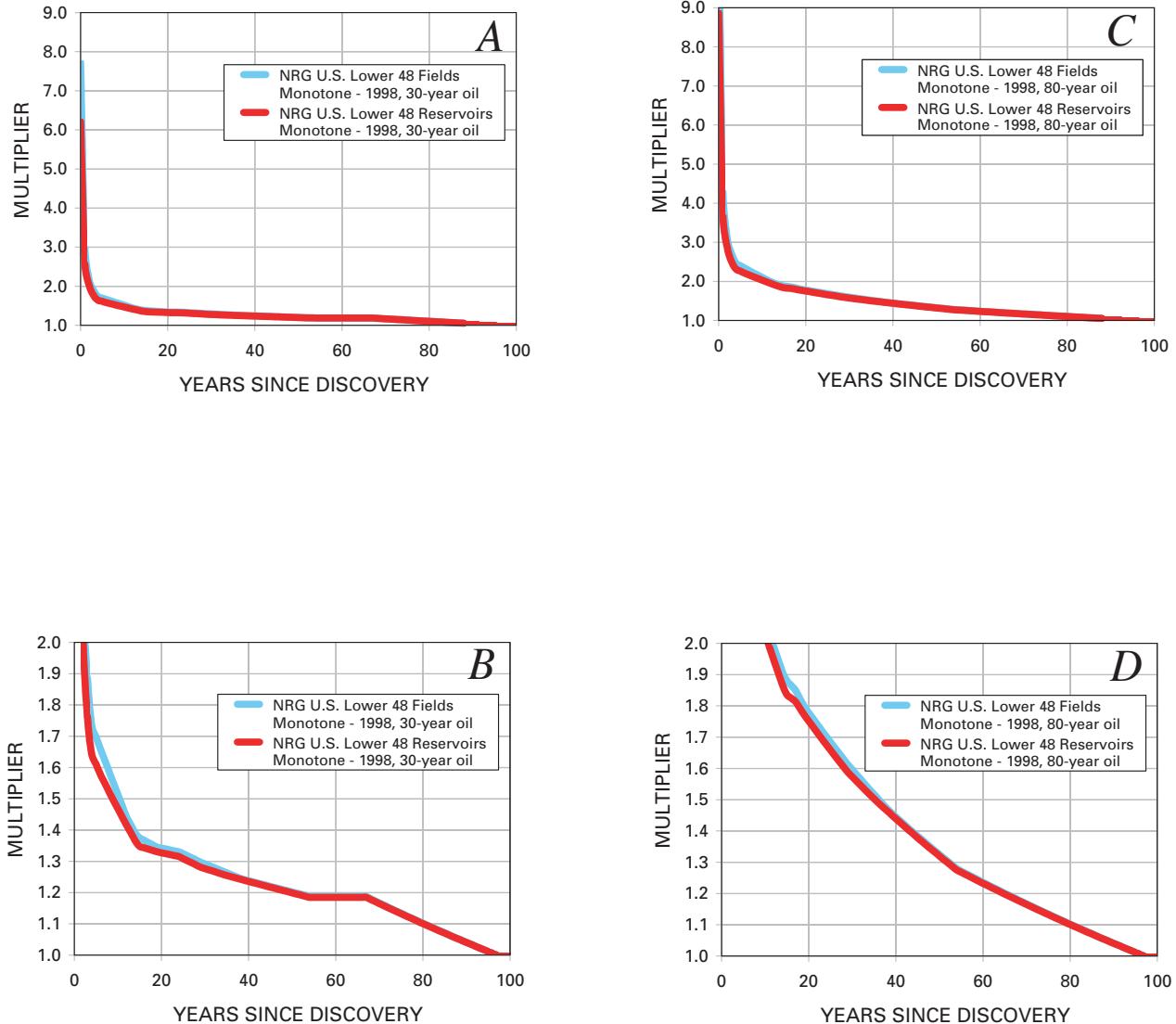


Figure 6 (above and following page). Comparison of forecast functions for fields and reservoirs (derived from the NRG Associates Fields, 1982 through 1998, and NRG Associates Reservoirs, 1982 through 1998 datasets). A–D, oil fields and reservoirs. A, 30-year forecast functions; B, same as A, but with expanded vertical axis; C, 80-year forecast functions; D, same as C, but with expanded vertical axis. E–H, gas fields and reservoirs. E, 30-year forecast functions; F, same as E, but with expanded vertical axis; G, 80-year forecast functions; H, same as G, but with expanded vertical axis.

multipliers for older fields. The 80-year MMS Federal Offshore—1996 forecast function differs the most from the other functions by providing much smaller multipliers for fields of all ages.

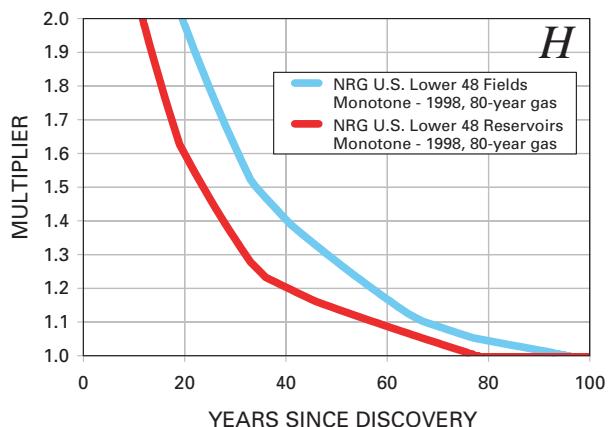
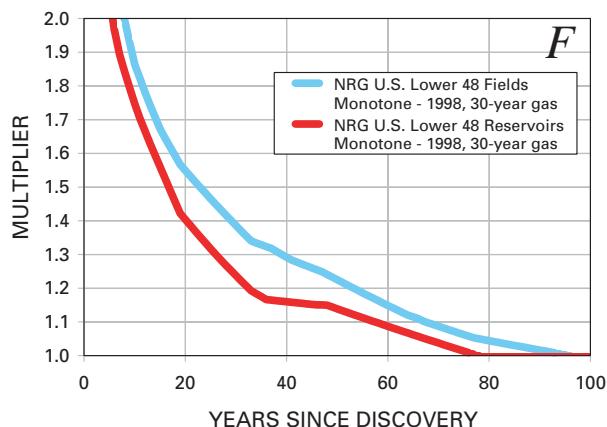
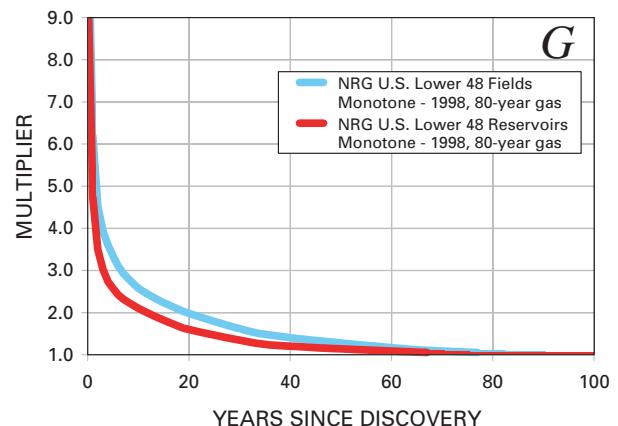
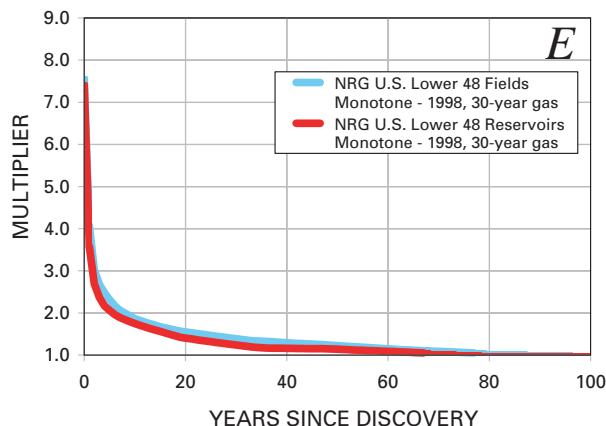
Functions for shorter forecast spans typically provide smaller multipliers than those for longer spans because fields with shorter forecast spans have less time for potential development (fig. 10). A field age does exist, however, beyond which the same multipliers apply to both shorter and longer

forecast spans. This age corresponds to the oldest field age in the dataset minus the forecast span.

Comparison of Forecasted Oil and Natural Gas Volumes

A comparison of the forecasted oil and natural gas additions to reserves serves to evaluate the relative sensitivity among the forecast functions. Multipliers from each of the forecast

**COMPARISON OF 30- AND 80-YEAR FORECAST FUNCTIONS
FOR GAS FIELDS AND RESERVOIRS DERIVED FROM NRG DATASETS**



functions were applied to a set of fields reported in the 1996 version of the Energy Information Administration database ([table 15](#)). The set of fields included only conventional fields of the Lower 48 United States, located onshore or in State waters. In addition, multipliers from forecast functions derived from the NRG models were respectively applied to a similar set of fields and reservoirs reported in the 1998 version of the NRG Associates database ([table 15](#)). A summary of estimated future additions to reserves (that is, reserve growth) using forecast functions derived from the various reserve-growth models and datasets is given in [table 16](#) and presented graphically in [figure 11](#).

The potential additions to natural gas liquids (ngl) reserves may be calculated by converting the gas in oil fields (wet gas)

volume using the relationship as given by Attanasi (2001):

$$175 \text{ TCF wet gas} = 166 \text{ TCF dry gas} + 7.8 \text{ BB ngl}^{**} \quad (10)$$

The estimated volumes do not vary much among the models when applied to fields reported in the Energy Information Administration (1996) database, except those calculated using the Arrington Method—1996, Mean of U.S. Lower 48 Annual Growth Factors—1996, and MMS Federal Offshore—1996 models. The Arrington Method—1996 and Mean of U.S. Lower 48 Annual Growth Factors—1996 models yield higher

**TCF-trillion cubic feet

**BB-billion barrels

COMPARISON OF 30-YEAR FORECAST FUNCTIONS DERIVED FROM OLDER AND NEWER EIA DATASETS

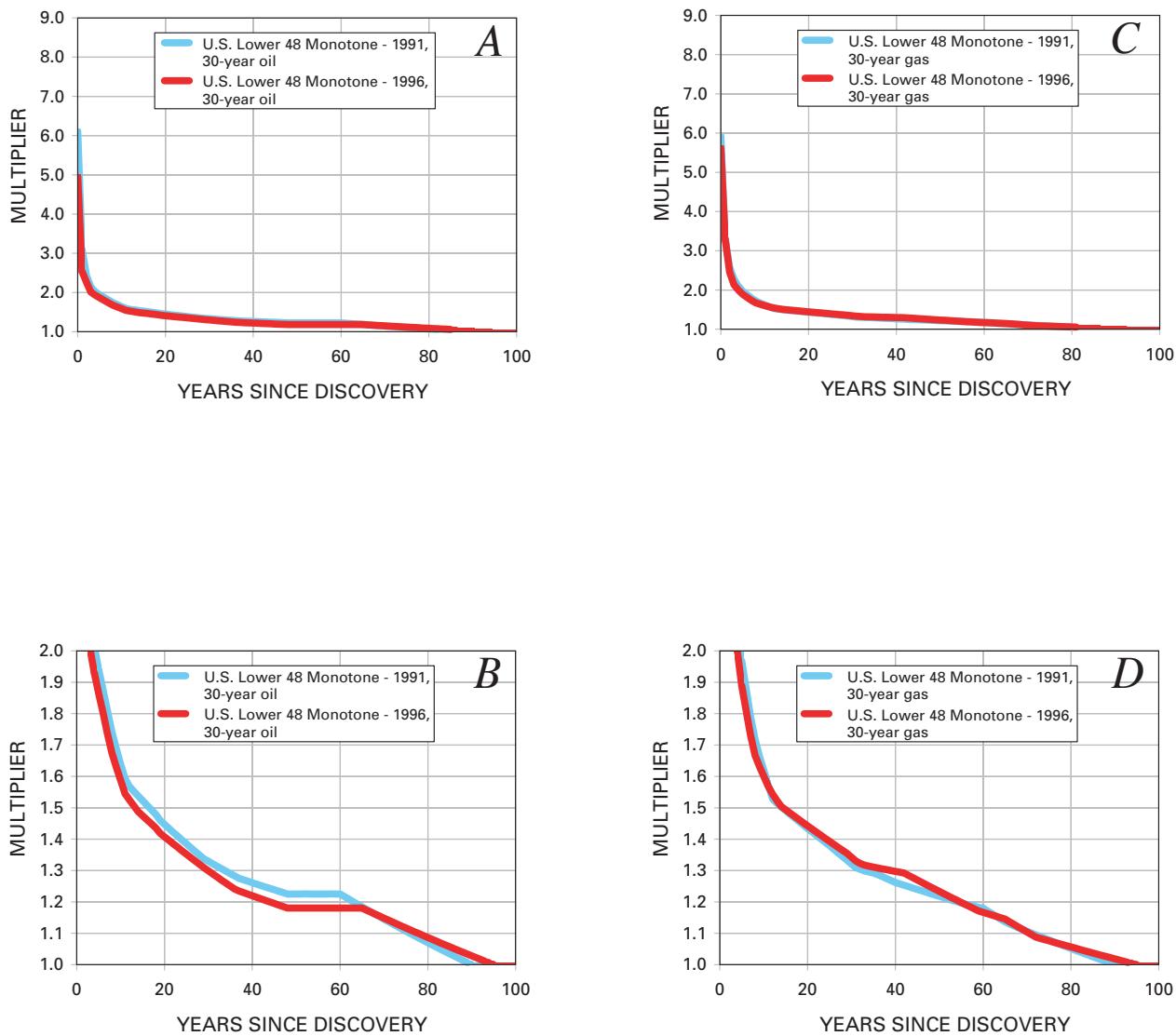


Figure 7. Comparison of forecast functions derived from older and newer data (Energy Information Administration, 1977 through 1991, and Energy Information Administration, 1977 through 1996 datasets). *A*, oil fields, 30-year forecast functions; *B*, same as *A*, but with expanded vertical axis; *C*, gas fields, 30-year forecast functions; *D*, same as *C*, but with expanded vertical axis.

forecasts because the annual growth function and thus its multipliers reflect the data variability, particularly the extremely large annual fractional changes that are observed in very young and very old field ages (see fig. 3). The MMS Federal Offshore—1996 model yields very low forecasts because it provides much smaller multipliers for older fields and assumes that fields older than 50 years of age will no longer experience reserve growth.

When applied to the NRG Associates (1999) database, the NRG U.S. Lower 48 Fields Monotone—1998 yielded volumes similar to those forecasted from the Energy Information Administration (1996) data. The NRG U.S. Lower 48

Reservoirs Monotone—1998 yielded smaller volumes when applied to the NRG Associates (1999) database, because this model does not include a major component of reserve growth, which is the discovery of new reservoirs in old fields.

Conclusions

The reserve-growth model used in the 1995 USGS National Assessment (Gautier and others, 1996) and the model currently used in the NOGA project provide forecast functions that yield

COMPARISON OF 30-YEAR FORECAST FUNCTIONS FOR OIL AND GAS FIELDS DERIVED FROM EIA AND NRG DATASETS

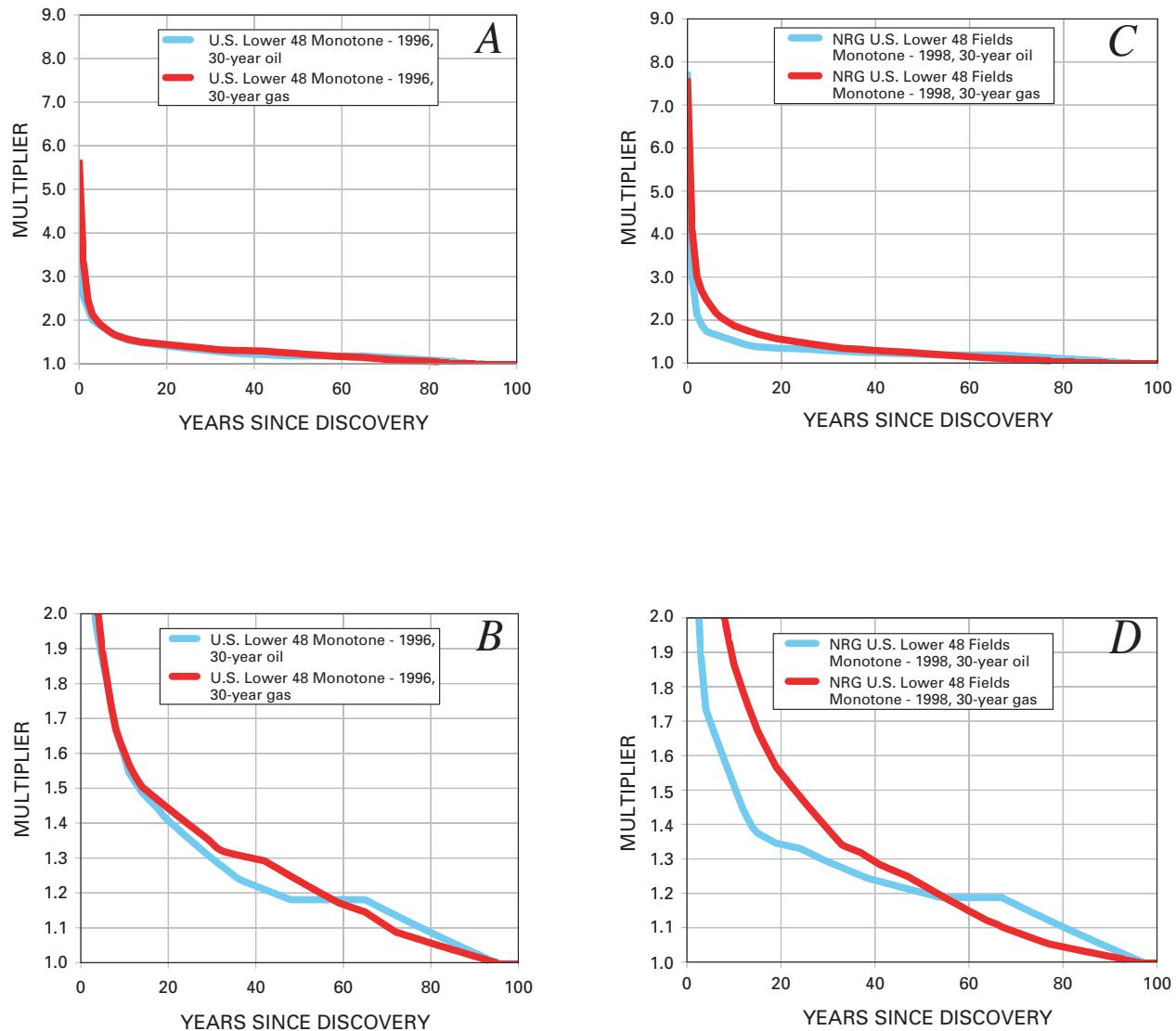


Figure 8. Comparison of forecast functions for oil fields and gas fields. *A*, 30-year forecast functions derived from the Energy Information Administration (1977 through 1996) dataset; *B*, same as *A*, but with expanded vertical axis; *C*, 30-year forecast functions derived from the NRG Associates Fields (1982 through 1998) dataset; *D*, same as *C*, but with expanded vertical axis.

similar estimates of potential additions to reserves. Both models are based on the Oil and Gas Integrated Field File (OGIFF) from the Energy Information Administration (EIA), but different vintages of data (from 1977 through 1991 and 1977 through 1996, respectively). The model based on newer data can be used in place of the previous model, providing similar estimates of potential additions to reserves. Forecast functions for oil fields vary little from those for gas fields in these models; therefore, a single function may be used for both oil and gas fields, like that used in the USGS World Petroleum Assessment 2000 (U.S. Geological Survey World Energy Assessment Team, 2000; Schmoker and Klett, 2000).

Forecast functions based on the field-level reserve growth model derived from the NRG Associates databases (from 1982 through 1998) differ from those derived from Energy Information Administration databases (from 1977 through 1996). However, the difference may not be enough to preclude the use of the forecast functions derived from NRG data in place of the forecast functions derived from EIA data. Should the model derived from NRG data be used, separate forecast functions for oil fields and gas fields must be employed. The forecast function for oil fields from the model derived from NRG data varies significantly from that for gas fields, and a single function for both oil and gas fields may not be appropriate.

COMPARISON OF 30- AND 80-YEAR FORECAST FUNCTIONS FOR OIL FIELDS

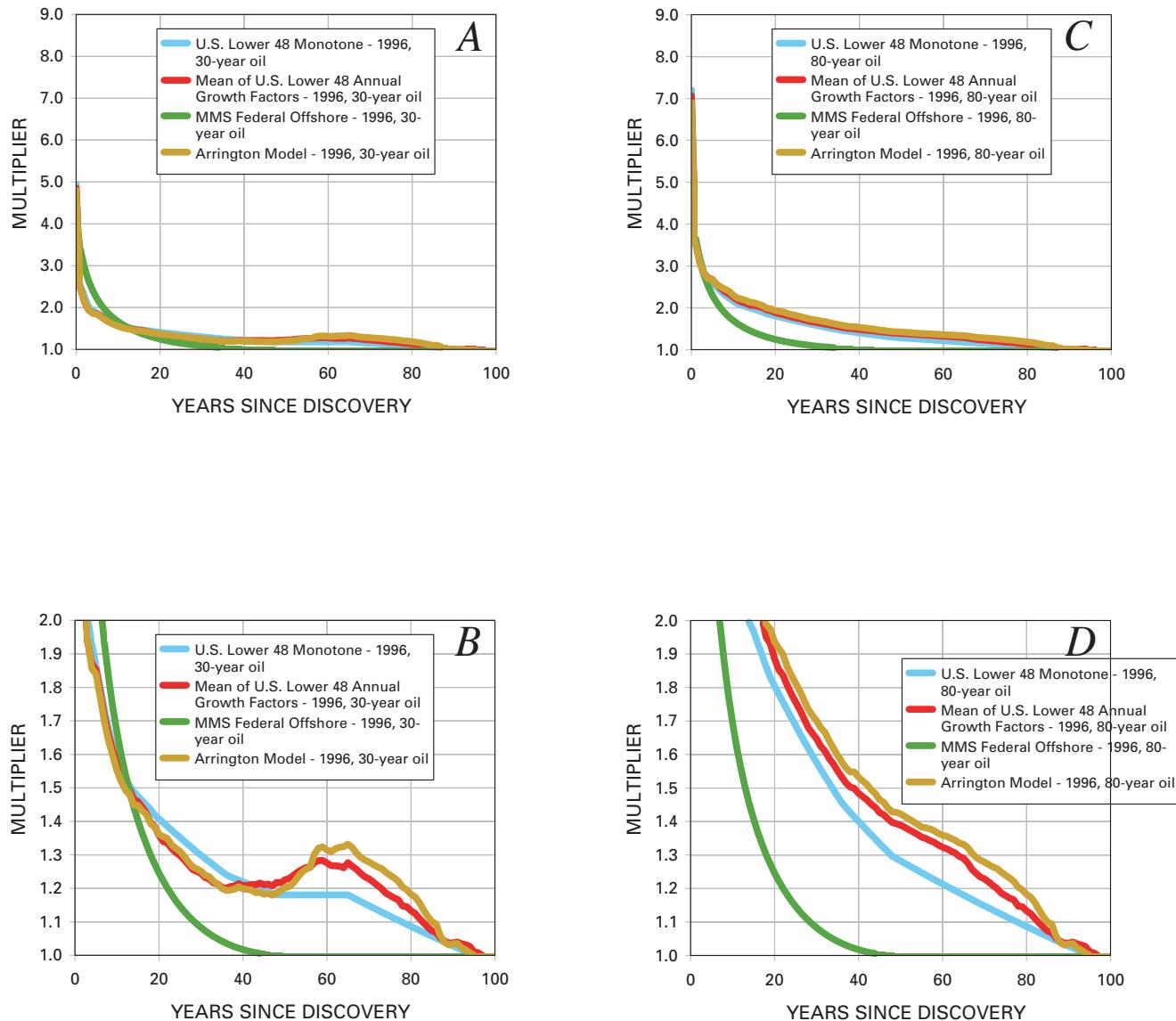


Figure 9. Comparison of forecast functions derived from different methods of construction: (1) annual growth factors calculated using the Arrington (1960) method, represented by the Arrington Model—1996; (2) central tendency of annual growth factors, represented by the Mean of U.S. Lower 48 Annual Growth Factors—1996 model; (3) least-squares method, having a monotonic constraint applied to annual fractional changes, represented by the U.S. Lower 48 Monotone—1996 model; and (4) regression analysis applied to annual growth factors calculated by the Arrington (1960) method, represented by the MMS Federal Offshore—1996 model. *A*, 30-year forecast functions; *B*, same as *A*, but with expanded vertical axis; *C*, 80-year forecast functions; *D*, same as *C*, but with expanded vertical axis.

COMPARISON OF 30- AND 80-YEAR FORECAST FUNCTIONS FOR OIL AND GAS FIELDS

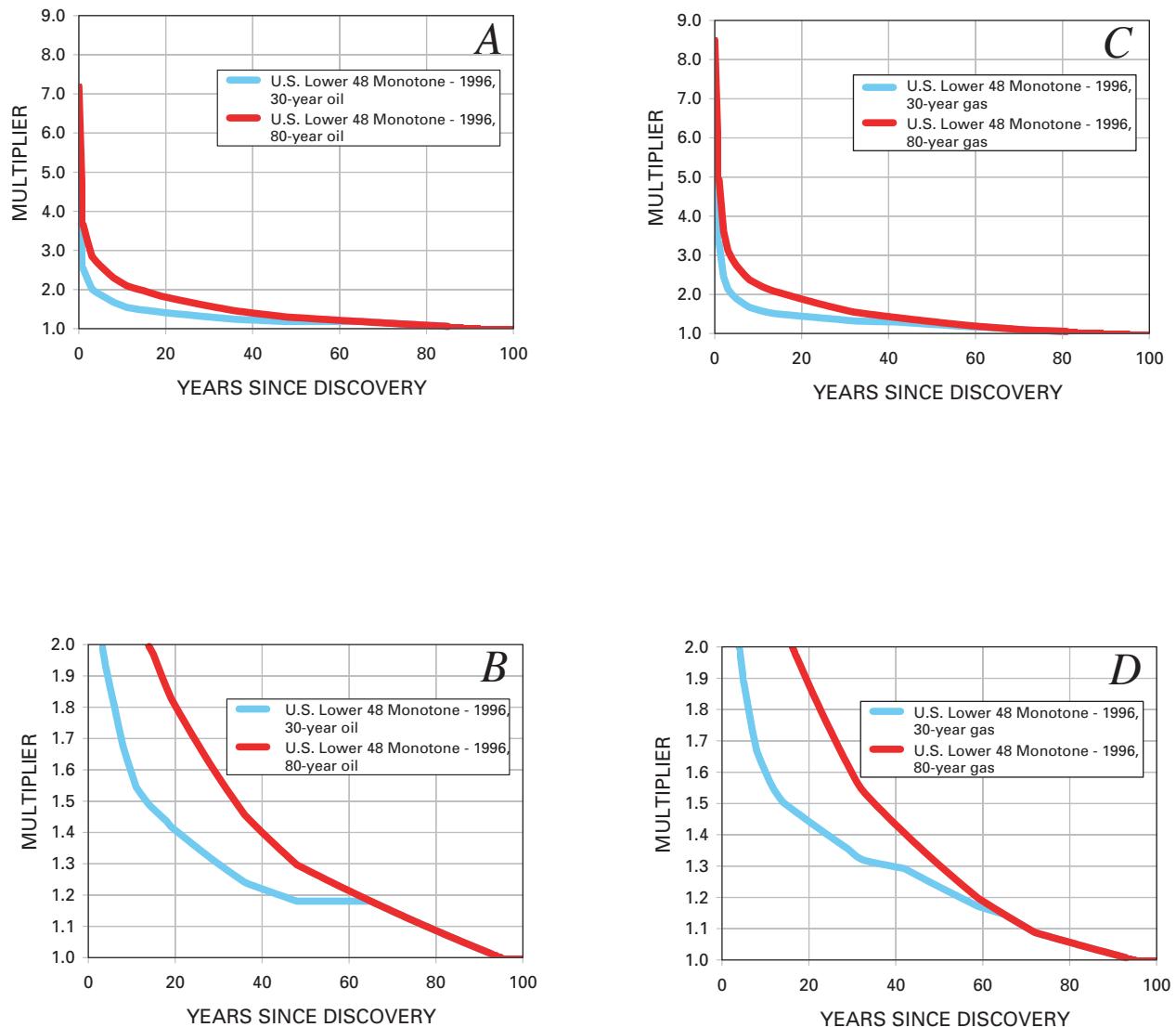
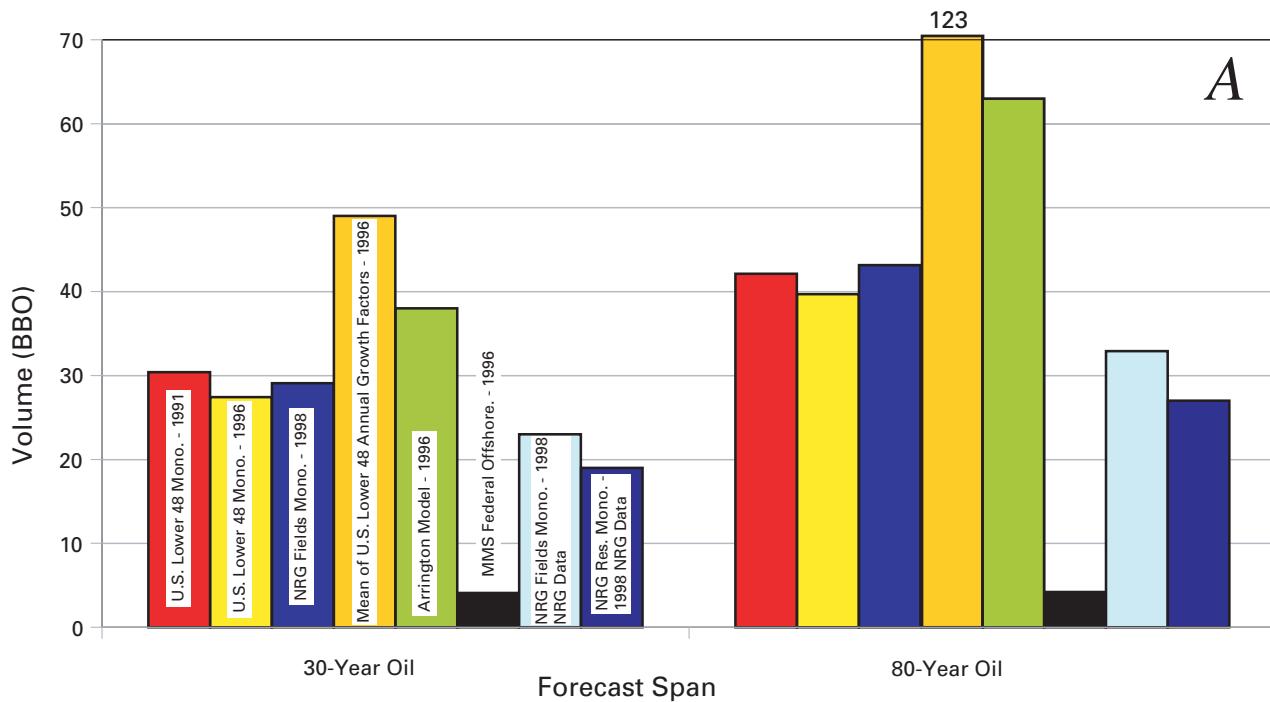


Figure 10. Comparison of forecast functions for shorter and longer forecast spans (derived from the Energy Information Administration, 1977 through 1996 dataset). Notice the abrupt change in slope to values of 1 within each of the functions (starting at 66 years-since-discovery for the 30-year forecast function and starting at 16 years-since-discovery for the 80-year forecast function). *A*, oil fields; *B*, same as *A*, but with expanded vertical axis; *C*, gas fields; *D*, same as *C*, but with expanded vertical axis.

Potential Additions to U.S. Oil Reserves
 (Conventional Fields, Lower 48 States, Onshore and State Waters)



Potential Additions to U.S. Gas Reserves
 (Conventional Fields, Lower 48 States, Onshore and State Waters)

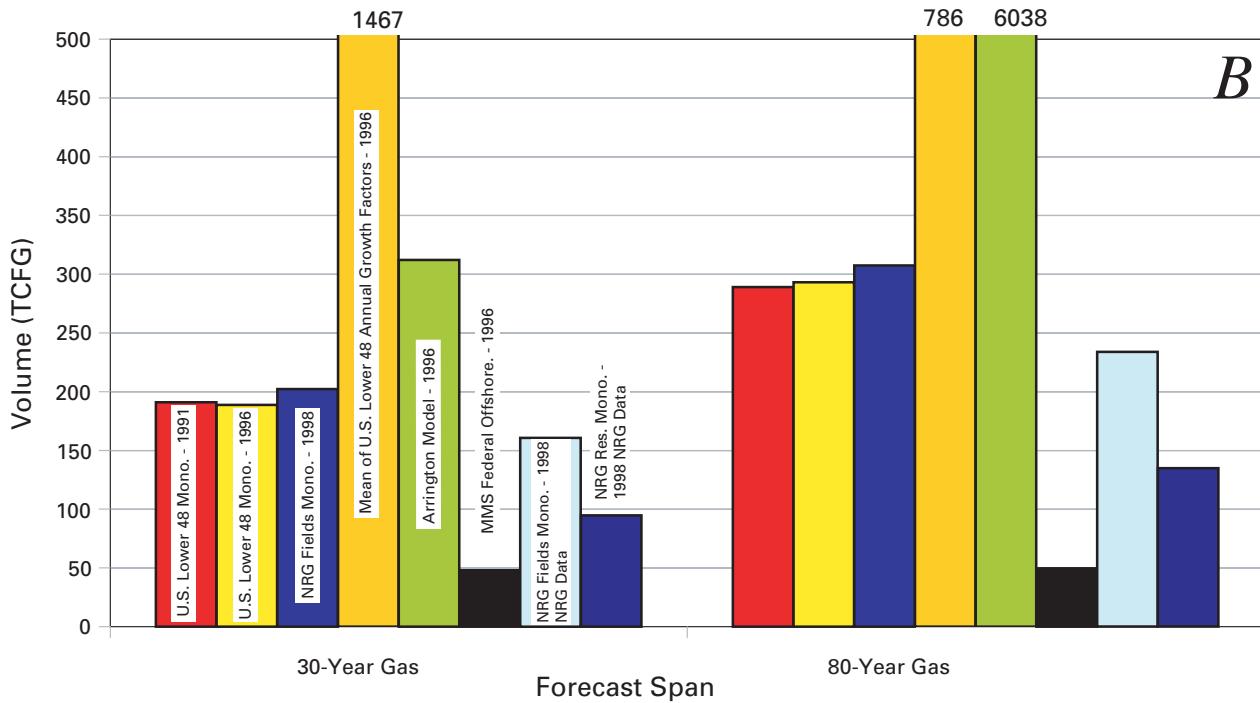


Figure 11. Estimated additions to reserves using forecast functions derived from the various reserve-growth models. Multipliers from each of the forecast functions were applied to a set of recoverable oil and gas volumes for fields reported in the 1996 version of the Energy Information Administration database. In addition, multipliers from forecast functions derived from the NRG models were respectively applied to a similar set of data for fields and reservoirs reported in the 1998 version of the NRG Associates database (labeled as NRG Data). A summary of the results is given in table 16. A natural gas liquids component is included in the estimated natural gas volumes. *A*, potential additions to oil reserves; *B*, potential additions to gas reserves.

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Table 1. Discovery table showing recoverable oil in oil fields based on the Energy Information Administration (1977 through 1996) dataset.

[Source of data: Energy Information Administration, 1977 through 1996, Oil and gas integrated field file (unpublished). Comm., Commodity. Oil in oil fields in MMBO: conventional, Lower 48 States, onshore and State waters, created 7/8/00. Fields were classified as oil if the field gas-to-oil ratio is less than 20,000 cubic feet per barrel]

Comm.	Discovery year	Report year																		No. fields		
		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
oil	1898	1,730	1,762	1,747	1,788	1,778	1,787	1,788	1,819	1,748	1,789	1,818	1,854	1,838	1,841	1,839	1,860	1,950	1,956	1,966	1,975	320
oil	1899	5,101	5,160	5,259	5,313	5,347	5,412	5,514	5,636	5,745	5,826	5,862	5,916	5,917	5,934	5,927	5,930	5,911	5,904	5,991	6,058	104
oil	1900	649	659	669	674	677	700	702	718	731	714	724	732	731	740	743	748	748	755	763	755	21
oil	1901	2,289	2,265	2,367	2,474	2,515	2,542	2,608	2,812	2,944	2,983	3,030	3,263	3,435	3,480	3,475	3,479	3,539	3,578	3,621	3,651	15
oil	1902	945	948	940	968	948	980	995	1,040	1,039	1,056	1,124	1,135	1,221	1,188	1,201	1,190	1,170	1,174	1,175	1,165	12
oil	1903	110	110	111	111	113	114	115	117	118	118	120	121	122	122	123	124	124	123	123	124	13
oil	1904	577	589	591	595	595	601	596	601	613	616	619	621	622	625	628	631	633	637	639	643	16
oil	1905	1,912	1,865	1,893	1,872	1,864	1,885	1,918	1,912	1,927	1,954	1,955	1,966	2,013	2,020	2,034	2,054	2,057	2,077	2,093	2,093	17
oil	1906	797	809	820	835	841	837	841	862	879	904	913	930	937	959	965	964	951	964	957	917	25
oil	1907	15	15	16	17	18	18	18	19	18	18	18	18	18	18	18	18	18	18	18	18	14
oil	1908	55	55	57	57	58	58	58	59	59	60	60	61	62	62	65	63	63	62	65	65	9
oil	1909	1,546	1,531	1,536	1,542	1,536	1,519	1,515	1,570	1,576	1,570	1,587	1,566	1,557	1,554	1,559	1,552	1,577	1,525	1,525	1,527	16
oil	1910	1,739	1,728	1,750	1,766	1,804	1,800	1,812	1,824	1,856	1,854	1,877	1,896	1,925	1,949	1,974	2,011	2,068	2,084	2,073	2,084	17
oil	1911	1,436	1,683	1,816	1,925	1,923	1,952	1,983	2,007	2,043	2,146	2,252	2,382	2,431	2,451	2,497	2,492	2,523	2,545	2,556	2,695	18
oil	1912	1,161	1,179	1,194	1,222	1,250	1,256	1,255	1,264	1,307	1,339	1,348	1,357	1,381	1,383	1,375	1,376	1,374	1,378	1,376	1,376	17
oil	1913	708	713	722	724	725	737	739	746	753	754	753	758	767	763	768	775	774	777	782	786	25
oil	1914	402	408	418	433	445	445	465	467	472	464	469	470	473	473	471	478	477	479	478	489	30
oil	1915	1,322	1,314	1,344	1,355	1,376	1,359	1,379	1,387	1,437	1,424	1,463	1,465	1,492	1,488	1,486	1,490	1,495	1,474	1,474	1,480	29
oil	1916	2,153	2,161	2,195	2,205	2,219	2,250	2,287	2,337	2,366	2,383	2,424	2,438	2,497	2,536	2,549	2,562	2,582	2,592	2,604	2,659	41
oil	1917	1,101	1,094	1,076	1,094	1,108	1,117	1,123	1,129	1,141	1,129	1,141	1,146	1,146	1,145	1,150	1,152	1,154	1,153	1,155	1,162	40
oil	1918	933	933	942	955	960	954	962	976	994	979	983	988	990	999	998	1,001	997	1,011	1,015	1,015	30
oil	1919	2,624	2,651	2,704	2,725	2,726	2,741	2,774	2,778	2,776	2,794	2,788	2,792	2,802	2,812	2,819	2,820	2,819	2,823	2,822	2,828	48
oil	1920	2,345	2,355	2,359	2,376	2,404	2,414	2,431	2,461	2,468	2,574	2,545	2,605	2,571	2,579	2,556	2,564	2,571	2,574	2,555	2,562	56
oil	1921	1,998	1,976	1,961	1,953	1,957	1,958	1,962	1,971	1,984	1,972	1,980	1,982	1,995	1,991	1,992	1,996	1,994	1,988	1,991	1,996	45
oil	1922	1,634	1,642	1,640	1,659	1,662	1,674	1,683	1,698	1,701	1,688	1,708	1,718	1,753	1,780	1,770	1,768	1,766	1,765	1,763	1,774	50
oil	1923	1,356	1,355	1,361	1,379	1,388	1,401	1,420	1,431	1,474	1,469	1,501	1,482	1,490	1,500	1,492	1,501	1,493	1,491	1,507	1,525	41
oil	1924	1,177	1,174	1,176	1,175	1,192	1,200	1,214	1,231	1,243	1,241	1,251	1,265	1,278	1,283	1,284	1,292	1,304	1,315	1,325	50	
oil	1925	1,301	1,293	1,316	1,329	1,338	1,350	1,367	1,379	1,398	1,399	1,437	1,435	1,468	1,483	1,488	1,486	1,490	1,505	1,509	1,545	59
oil	1926	4,001	4,054	4,093	4,103	4,148	4,082	4,125	4,148	4,202	4,223	4,250	4,281	4,301	4,315	4,324	4,338	4,371	4,388	4,394	4,419	79
oil	1927	1,962	1,956	1,957	1,966	1,979	1,986	2,007	2,051	2,043	2,049	2,067	2,061	2,071	2,077	2,088	2,095	2,099	2,108	2,120	2,125	80
oil	1928	2,960	2,966	2,981	3,017	3,037	3,078	3,104	3,120	3,145	3,144	3,160	3,179	3,185	3,182	3,185	3,186	3,188	3,197	3,202	75	
oil	1929	4,048	4,109	3,988	3,989	4,010	4,026	4,090	4,178	4,209	4,215	4,234	4,294	4,281	4,299	4,316	4,331	4,361	4,377	4,403	4,455	93
oil	1930	8,071	8,039	7,953	8,019	8,035	7,996	8,062	8,092	8,114	8,112	8,139	8,165	8,195	8,215	8,176	8,190	8,228	8,246	8,252	8,277	53
oil	1931	2,124	2,110	2,082	2,081	2,090	2,091	2,098	2,110	2,116	2,125	2,126	2,140	2,154	2,164	2,167	2,173	2,186	2,193	2,197	30	
oil	1932	3,036	3,043	3,223	3,210	3,196	3,194	3,191	3,237	3,222	3,203	3,247	3,263	3,249	3,239	3,255	3,258	3,256	3,277	3,283	3,292	45
oil	1933	1,079	1,091	1,103	1,090	1,092	1,093	1,102	1,110	1,117	1,129	1,138	1,143	1,148	1,149	1,146	1,155	1,155	1,154	1,156	1,159	41
oil	1934	2,418	2,413	2,414	2,418	2,433	2,440	2,474	2,524	2,527	2,531	2,554	2,549	2,562	2,571	2,586	2,597	2,612	2,615	2,624	2,631	70
oil	1935	2,877	2,866	2,803	2,808	2,822	2,833	2,853	2,868	2,876	2,878	2,887	2,911	2,934	2,942	2,986	2,996	3,012	3,039	3,042	3,055	96
oil	1936	2,537	2,538	2,579	2,607	2,747	2,753	2,785	2,802	2,833	2,848	2,886	2,926	2,916	2,916	2,952	2,979	3,002	3,018	3,031	3,038	112

Table 1. Discovery table showing recoverable oil in oil fields based on the Energy Information Administration (1977 through 1996) dataset—Continued.

Comm.	Discovery year	Report year																	No. fields			
		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
oil	1937	5,580	5,641	5,700	6,007	6,123	6,259	6,273	6,429	6,723	6,654	6,726	6,872	6,955	7,016	7,079	7,064	7,012	6,883	6,963	6,967	136
oil	1938	4,958	4,915	4,906	4,941	4,966	5,016	5,034	5,061	5,114	5,120	5,148	5,141	5,155	5,180	5,210	5,232	5,270	5,272	5,292	5,297	156
oil	1939	1,679	1,678	1,658	1,655	1,672	1,656	1,660	1,676	1,686	1,693	1,725	1,739	1,745	1,767	1,777	1,760	1,757	1,761	1,761	1,793	150
oil	1940	4,079	4,057	3,830	3,857	3,880	3,898	3,933	3,977	4,077	4,119	4,172	4,203	4,227	4,252	4,257	4,273	4,279	4,357	4,368	4,383	182
oil	1941	1,448	1,446	1,434	1,424	1,435	1,437	1,450	1,474	1,488	1,488	1,492	1,501	1,511	1,518	1,519	1,522	1,519	1,525	1,529	1,538	208
oil	1942	1,680	1,685	1,732	1,753	1,773	1,786	1,803	1,820	1,866	1,880	1,894	1,906	1,925	1,968	1,971	1,973	1,973	1,992	2,019	2,020	188
oil	1943	1,131	1,154	1,158	1,171	1,184	1,196	1,208	1,226	1,237	1,254	1,267	1,279	1,294	1,302	1,311	1,313	1,314	1,311	1,313	1,325	198
oil	1944	2,661	2,687	2,696	2,752	2,760	2,786	2,811	2,862	2,922	2,914	2,941	2,968	2,997	3,006	3,017	3,051	3,015	3,040	3,044	3,055	239
oil	1945	2,736	2,745	2,829	2,862	2,909	2,937	2,977	3,010	3,111	3,148	3,223	3,264	3,294	3,328	3,317	3,348	3,363	3,393	3,415	3,459	222
oil	1946	852	852	851	853	860	882	881	886	896	917	920	914	926	932	929	924	925	934	935	940	196
oil	1947	1,695	1,688	1,671	1,764	1,780	1,778	1,813	1,826	1,870	1,866	1,898	1,879	1,903	1,920	1,936	1,938	1,946	1,964	1,967	1,987	257
oil	1948	2,946	2,963	2,961	2,987	2,995	3,090	3,149	3,173	3,184	3,152	3,175	3,197	3,211	3,220	3,132	3,143	3,151	3,165	3,174	3,194	352
oil	1949	2,222	2,213	2,209	2,240	2,251	2,288	2,339	2,375	2,428	2,485	2,522	2,523	2,531	2,568	2,579	2,582	2,586	2,612	2,610	2,628	408
oil	1950	3,227	3,305	3,341	3,377	3,414	3,450	3,523	3,596	3,690	3,748	3,806	3,881	3,914	4,044	4,104	4,106	4,103	4,173	4,264	4,335	525
oil	1951	1,447	1,441	1,457	1,470	1,498	1,532	1,553	1,568	1,590	1,612	1,624	1,647	1,660	1,677	1,674	1,686	1,692	1,693	1,699	1,713	606
oil	1952	1,652	1,642	1,644	1,658	1,680	1,696	1,700	1,722	1,839	1,769	1,796	1,796	1,815	1,830	1,838	1,858	1,851	1,863	1,872	1,892	682
oil	1953	2,046	2,070	2,094	2,139	2,187	2,213	2,256	2,297	2,316	2,322	2,351	2,371	2,403	2,430	2,446	2,450	2,491	2,516	2,543	2,597	765
oil	1954	1,117	1,119	1,135	1,139	1,165	1,162	1,176	1,187	1,203	1,201	1,211	1,220	1,237	1,246	1,254	1,260	1,268	1,267	1,280	1,289	677
oil	1955	1,144	1,152	1,164	1,179	1,199	1,225	1,242	1,275	1,294	1,302	1,310	1,326	1,348	1,361	1,370	1,383	1,397	1,421	1,433	1,444	811
oil	1956	1,493	1,511	1,567	1,608	1,639	1,658	1,711	1,745	1,788	1,805	1,863	1,882	1,944	1,988	2,008	2,028	2,067	2,102	2,125	2,133	728
oil	1957	949	967	982	1,000	1,022	1,042	1,063	1,097	1,117	1,123	1,140	1,147	1,165	1,173	1,173	1,196	1,211	1,224	1,225	1,228	700
oil	1958	1,484	1,490	1,425	1,431	1,451	1,436	1,458	1,483	1,503	1,511	1,524	1,545	1,574	1,584	1,572	1,584	1,593	1,619	1,632	1,650	589
oil	1959	759	759	769	790	794	819	830	842	867	872	884	896	894	905	916	921	925	944	957	982	607
oil	1960	793	811	802	851	843	861	889	905	914	915	922	937	937	939	954	955	967	974	988	998	475
oil	1961	369	374	386	393	408	427	438	454	471	468	479	479	492	497	506	513	510	510	514	521	453
oil	1962	547	552	563	581	600	614	651	659	668	673	687	685	679	684	694	700	699	715	724	734	487
oil	1963	355	358	366	383	411	423	433	449	457	466	471	485	494	521	532	540	542	552	565	565	456
oil	1964	481	463	469	474	490	504	516	529	547	551	558	560	567	582	602	621	622	624	658	681	454
oil	1965	461	473	491	503	512	520	532	546	556	561	568	575	585	593	608	609	613	620	628	630	411
oil	1966	474	464	485	498	514	486	499	506	512	519	515	516	528	528	529	522	534	538	537	547	457
oil	1967	345	355	366	385	384	388	402	407	421	426	438	450	451	453	460	463	462	470	480	487	438
oil	1968	314	321	319	330	340	353	367	370	384	386	386	393	397	407	415	419	427	429	434	449	407
oil	1969	328	341	350	365	372	382	388	396	409	417	422	425	429	437	438	447	450	453	465	467	437
oil	1970	784	805	812	873	892	922	925	958	977	983	990	1,009	1,018	1,023	1,024	1,040	1,076	1,112	1,116	1,153	335
oil	1971	170	180	187	199	208	221	240	232	245	245	247	256	259	268	292	306	297	287	299	309	321
oil	1972	413	441	442	470	483	503	518	536	561	566	578	629	638	680	652	653	654	659	664	671	391
oil	1973	155	161	176	197	220	222	229	235	243	243	246	247	248	252	256	260	262	271	275	278	329
oil	1974	390	410	410	446	445	462	505	528	543	542	549	646	591	606	600	613	604	613	620	614	409
oil	1975	185	193	205	232	233	246	251	263	276	283	293	294	304	311	312	316	325	337	342	482	
oil	1976	239	287	338	381	381	384	429	476	467	467	487	491	491	514	537	549	549	571	572	577	545
oil	1977	114	176	226	268	323	336	348	381	394	397	407	429	477	507	504	508	509	517	543	554	612

Table 1. Discovery table showing recoverable oil in oil fields based on the Energy Information Administration (1977 through 1996) dataset—Continued.

Comm.	Discovery year	Report year																		No. fields				
		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996			
oil	1978	0	51	101	130	153	159	186	208	242	229	238	243	248	256	261	267	276	287	291	298	500		
oil	1979	0	0	69	158	191	264	292	312	326	360	369	406	442	460	452	466	477	485	488	525	584		
oil	1980	0	0	0	116	325	331	363	353	343	368	372	388	390	403	414	421	417	403	427	435	687		
oil	1981	0	0	0	0	83	161	186	219	270	259	276	289	304	311	315	337	335	336	347	351	867		
oil	1982	0	0	0	0	0	128	225	245	259	257	259	275	282	302	302	318	314	315	316	327	805		
oil	1983	0	0	0	0	0	0	74	145	186	178	212	209	220	229	246	232	246	243	248	252	741		
oil	1984	0	0	0	0	0	0	0	92	168	174	183	184	200	203	211	218	226	229	236	251	850		
oil	1985	0	0	0	0	0	0	0	0	92	159	190	221	226	227	235	258	264	276	284	284	724		
oil	1986	0	0	0	0	0	0	0	0	0	37	69	77	86	94	93	96	97	98	109	109	405		
oil	1987	0	0	0	0	0	0	0	0	0	0	45	91	104	99	104	114	122	121	126	126	343		
oil	1988	0	0	0	0	0	0	0	0	0	0	0	48	79	90	97	98	93	95	98	102	352		
oil	1989	0	0	0	0	0	0	0	0	0	0	0	0	0	32	71	89	107	88	84	86	87	223	
oil	1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	70	84	81	73	67	70	242	
oil	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41	67	81	86	84	90	200	
oil	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	56	71	78	79	200
oil	1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	38	44	54	180	
oil	1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	80	78	203	
oil	1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	71	163		
oil	1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	93		
Total oil		130,131	131,008	131,932	134,119	135,804	137,172	139,144	141,501	143,955	144,758	146,494	148,284	149,735	151,018	151,665	152,399	153,060	153,855	154,887	156,186			

Table 2. Discovery table showing recoverable gas in gas fields based on the Energy Information Administration (1977 through 1996) dataset.

[Source of data: Energy Information Administration, 1977 through 1996, Oil and gas integrated field file (unpublished). Comm., Commodity. Gas in gas fields in BCFG: conventional, Lower 48 States, onshore and State waters, created 7/8/00. Fields were classified as gas if the field gas-to-oil ratio is 20,000 cubic feet per barrel or more]

Comm.	Discovery year	Report year																			No. fields	
		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
gas	1898	24,759	25,239	25,782	26,500	26,332	26,533	26,792	26,131	25,832	26,343	26,789	27,331	26,600	27,245	27,155	27,056	29,576	28,635	28,158	29,344	333
gas	1899	56	74	83	93	71	98	151	176	219	287	293	294	309	309	333	416	417	455	478	507	123
gas	1900	16	19	17	18	21	22	25	29	71	75	81	82	77	79	79	87	90	95	99	104	17
gas	1901	18	20	20	31	29	28	42	45	47	52	56	57	56	61	66	65	64	71	88	102	8
gas	1902	0	0	0	2	3	3	3	3	5	4	2	4	5	6	6	4	7	8	9	11	9
gas	1903	0	0	0	0	0	0	6	7	4	4	4	6	7	7	9	10	9	9	10	10	3
gas	1904	67	67	66	67	67	68	71	72	74	70	70	79	83	92	113	101	85	85	84	84	6
gas	1905	0	0	0	0	0	0	0	0	0	0	1	1	1	1	3	2	3	7	8	7	4
gas	1906	0	0	0	0	0	0	0	0	0	0	1	1	2	1	2	3	1	1	1	1	3
gas	1907	1	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	1	2	2	2
gas	1908	1	1	3	3	4	4	5	9	44	53	51	53	56	57	67	67	78	78	81	89	6
gas	1909	6	6	6	6	14	15	15	44	47	49	48	48	56	58	70	64	73	66	85	8	
gas	1910	1,056	1,092	1,086	1,116	1,095	1,291	1,816	1,864	2,069	2,170	2,265	2,728	2,450	2,507	2,472	2,647	2,803	2,848	2,952	2,608	12
gas	1911	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	7
gas	1912	72	72	76	71	69	95	81	78	81	86	78	87	87	90	93	96	94	104	116	112	8
gas	1913	99	96	98	100	146	113	118	122	123	121	134	138	140	142	151	153	153	159	155	157	6
gas	1914	2,342	2,401	2,407	2,387	2,471	2,448	2,456	2,482	2,549	2,767	2,958	3,008	3,120	3,206	3,316	3,276	3,340	3,402	3,477	3,548	14
gas	1915	114	114	108	113	117	118	120	136	121	127	129	160	151	150	147	144	144	155	153	153	11
gas	1916	10,289	10,328	10,416	10,665	10,663	10,733	10,961	10,870	11,011	11,077	11,092	11,293	11,483	11,404	11,425	11,576	11,565	11,620	11,744	11,842	14
gas	1917	294	291	293	300	311	316	315	318	326	351	353	353	348	354	356	362	355	362	366	374	12
gas	1918	28,998	29,095	29,188	29,356	29,330	29,447	29,511	29,488	29,469	29,481	29,771	29,877	30,165	30,353	30,576	30,658	30,679	30,925	31,191	31,197	12
gas	1919	636	654	660	656	685	689	697	700	712	739	755	764	772	794	770	780	778	789	816	803	13
gas	1920	159	158	162	170	185	182	217	206	214	195	213	190	190	191	196	203	200	199	205	205	11
gas	1921	303	313	312	325	340	335	357	364	368	370	365	375	364	424	431	446	445	471	450	449	11
gas	1922	38,318	38,528	38,928	38,590	39,602	39,221	39,663	39,834	39,823	41,305	41,734	41,529	42,283	42,453	42,922	43,629	43,623	44,176	44,669	43,969	17
gas	1923	134	144	137	142	131	138	140	141	137	136	143	159	157	157	156	159	162	160	170	177	11
gas	1924	3,102	3,104	3,113	3,104	3,125	3,129	3,153	3,189	3,191	3,193	3,191	3,209	3,235	3,264	3,291	3,316	3,291	3,333	3,338	3,363	14
gas	1925	2,826	2,943	2,991	2,899	2,930	3,032	3,013	3,040	3,050	3,019	3,011	3,033	3,094	3,095	3,089	3,102	3,127	3,129	3,215	3,260	14
gas	1926	2,339	2,333	2,321	2,351	2,369	2,399	2,386	2,389	2,467	2,458	2,472	2,463	2,475	2,466	2,486	2,493	2,504	2,513	2,507	2,519	14
gas	1927	1,074	1,026	1,098	1,127	1,120	1,144	1,113	1,148	1,189	1,168	1,204	1,204	1,208	1,211	1,215	1,262	1,265	1,286	1,290	1,316	18
gas	1928	2,909	2,840	2,884	2,914	2,928	3,029	2,988	3,061	2,933	3,045	2,966	3,027	3,063	3,074	3,139	3,449	3,482	3,542	3,520	3,558	17
gas	1929	2,063	2,137	2,210	2,221	2,260	2,249	2,299	2,309	2,331	2,332	2,360	2,387	2,418	2,476	2,591	2,673	2,748	2,841	2,906	2,898	16
gas	1930	4,678	4,667	4,678	4,695	4,781	4,750	4,771	4,737	4,713	4,726	4,728	4,739	4,754	4,768	4,780	4,798	4,817	4,819	4,844	4,854	22
gas	1931	820	852	865	874	924	939	844	856	852	872	876	909	915	917	916	911	916	919	949	959	6
gas	1932	523	525	530	533	538	541	548	549	556	551	572	583	585	607	585	584	588	592	595	9	
gas	1933	373	376	376	374	388	403	411	451	485	489	502	538	556	581	568	564	580	557	566	597	8
gas	1934	4,906	5,042	5,017	4,982	5,126	5,133	5,162	5,230	5,251	5,244	5,237	5,274	5,325	5,401	5,407	5,378	5,432	5,412	5,527	5,565	12
gas	1935	4,904	4,968	5,002	4,996	5,021	5,034	5,122	5,060	5,153	5,179	5,221	5,156	5,184	5,230	5,246	5,260	5,259	5,298	5,313	5,344	18
gas	1936	14,465	14,793	15,046	15,469	15,489	15,542	16,004	15,823	15,831	16,041	16,191	16,409	17,124	17,361	17,498	17,704	18,186	18,222	18,772	19,261	28

Table 2. Discovery table showing recoverable gas in gas fields based on the Energy Information Administration (1977 through 1996) dataset—Continued.

Comm.	Discovery year	Report year																	No. fields			
		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
gas	1937	14,388	14,129	14,323	13,890	14,031	14,114	14,057	14,349	14,529	14,820	14,997	15,127	15,275	15,386	15,376	15,520	15,566	15,642	15,816	15,983	40
gas	1938	15,778	15,881	16,115	16,008	16,228	15,975	16,046	16,243	16,388	16,336	16,495	16,645	17,005	17,119	17,411	17,404	17,624	17,837	17,906	18,090	42
gas	1939	2,773	2,783	2,767	2,796	2,790	2,779	2,811	2,856	2,846	2,855	2,886	2,893	2,931	2,953	2,971	2,989	3,011	3,034	3,048	3,078	28
gas	1940	6,222	6,241	6,321	6,363	6,411	6,449	6,571	6,680	6,648	6,747	6,834	6,818	6,860	6,819	7,021	7,123	7,331	7,359	7,469	7,619	38
gas	1941	5,257	5,293	5,310	5,382	5,375	5,460	5,521	5,706	5,873	6,056	6,391	6,686	6,770	6,905	6,830	6,841	6,850	6,969	7,167	7,215	46
gas	1942	5,886	5,938	5,900	5,862	5,845	5,857	5,882	5,924	5,883	5,830	5,997	6,064	6,017	6,071	6,104	6,167	6,238	6,289	6,325	6,391	46
gas	1943	4,491	4,634	4,653	4,734	4,877	4,898	4,958	4,886	4,965	4,983	5,025	5,107	5,243	5,221	5,240	5,308	5,340	5,425	5,480	5,534	52
gas	1944	7,264	7,349	7,299	7,330	7,349	7,492	7,567	7,570	7,556	7,610	7,689	7,820	7,848	7,979	8,029	8,091	8,197	8,309	8,372	8,508	80
gas	1945	11,950	12,239	12,379	12,455	12,810	13,210	13,206	13,322	13,537	13,637	13,816	13,948	14,099	14,322	14,418	14,606	14,714	14,821	15,094	15,456	90
gas	1946	9,736	9,966	10,046	10,264	10,223	10,325	10,408	10,525	10,635	10,650	10,808	11,037	11,289	11,462	11,551	11,581	11,736	11,942	12,086	12,193	65
gas	1947	3,459	3,721	3,777	4,188	4,416	4,458	4,564	4,753	4,949	4,893	4,865	4,790	4,854	5,004	5,201	5,037	5,157	5,285	5,346	5,385	77
gas	1948	5,226	5,608	5,671	5,678	5,983	6,306	6,158	6,251	6,344	6,661	6,712	6,775	6,861	7,061	7,099	7,188	7,300	7,443	7,529	7,635	83
gas	1949	14,318	14,186	14,226	14,420	14,632	14,693	14,423	14,466	14,570	14,550	14,571	14,750	14,853	14,940	15,026	15,048	15,163	15,243	15,464	15,566	109
gas	1950	2,841	2,777	2,862	2,923	2,939	2,914	2,975	2,969	3,054	3,099	3,140	3,264	3,220	3,237	3,257	3,356	3,378	3,409	3,433	3,439	92
gas	1951	7,968	8,169	8,119	8,295	8,279	8,500	8,378	8,500	8,630	8,697	8,694	9,079	9,021	9,229	9,256	9,424	9,484	9,629	9,689	9,775	111
gas	1952	11,069	11,204	11,329	11,484	11,734	12,053	12,273	12,332	12,266	12,194	12,288	12,519	12,624	12,673	12,730	12,776	12,831	13,285	13,477	13,744	150
gas	1953	12,035	12,205	12,654	12,492	12,851	13,522	14,214	14,341	14,532	14,747	14,896	14,317	15,259	14,835	14,745	14,941	14,788	14,965	14,851	15,333	193
gas	1954	9,212	9,186	9,299	9,329	9,612	9,757	9,867	9,921	10,075	9,960	10,035	10,178	10,344	10,777	10,845	11,089	11,208	11,300	11,376	11,508	200
gas	1955	5,890	5,899	5,971	6,036	6,180	6,302	6,292	6,486	6,578	7,163	7,621	7,803	8,348	8,028	8,206	8,242	8,333	8,465	8,552	8,848	201
gas	1956	9,977	10,205	10,505	10,673	10,973	11,242	11,569	11,588	11,904	12,268	12,136	12,618	12,815	12,982	13,038	13,358	13,574	13,699	13,705	13,974	195
gas	1957	8,220	8,594	8,786	8,879	8,938	9,032	9,271	9,423	9,422	9,742	9,833	9,836	9,923	10,095	10,138	10,246	10,387	10,537	10,715	10,925	205
gas	1958	11,718	11,835	11,706	11,666	11,867	12,460	12,340	12,460	12,633	12,429	12,422	12,805	12,948	13,252	13,404	13,513	13,572	13,974	14,150	14,345	220
gas	1959	7,059	7,278	7,730	7,631	7,960	8,150	8,443	8,048	8,209	8,378	8,494	8,619	8,666	8,840	8,952	9,034	9,180	9,507	9,679	9,943	227
gas	1960	6,658	6,971	6,968	6,904	7,161	7,391	7,450	7,685	8,225	8,076	8,324	8,606	8,877	9,212	9,427	9,553	9,657	9,897	10,180	10,474	211
gas	1961	5,272	5,273	5,373	5,456	5,496	5,676	6,107	6,083	6,241	6,070	6,094	6,269	6,413	6,487	6,583	6,510	6,709	6,777	6,851	6,973	209
gas	1962	4,000	4,095	4,152	4,444	4,724	4,718	4,861	4,848	4,895	5,061	5,171	5,089	5,166	5,243	5,303	5,258	5,362	5,419	5,467	5,505	168
gas	1963	8,105	8,311	8,565	8,535	8,675	8,798	8,701	8,843	8,942	9,066	9,243	9,561	9,642	9,923	10,041	10,091	10,443	10,663	10,795	10,893	178
gas	1964	4,407	4,440	4,057	4,292	4,507	4,550	4,594	4,648	4,758	4,845	4,927	5,180	5,252	5,394	5,447	5,538	5,729	6,096	6,053	6,165	204
gas	1965	2,933	3,051	3,116	3,033	3,129	3,329	3,371	3,431	3,454	3,468	3,537	3,588	3,658	3,723	3,704	3,674	3,677	3,768	3,807	3,925	177
gas	1966	3,190	3,163	3,211	3,230	3,382	3,759	3,639	3,692	3,883	4,000	4,114	4,311	4,444	4,598	4,703	4,883	5,006	5,209	5,361	5,535	170
gas	1967	2,572	2,684	2,719	2,776	2,832	2,912	3,000	2,926	3,000	3,066	3,121	3,143	3,196	3,279	3,192	3,336	3,321	3,341	3,415	3,593	160
gas	1968	2,668	3,002	3,190	3,439	3,387	3,628	3,716	3,771	3,791	3,272	3,175	3,190	3,246	3,220	3,216	3,317	3,466	3,471	3,573	3,671	123
gas	1969	5,293	5,520	5,620	5,667	5,798	5,828	5,974	6,020	6,063	6,056	6,121	6,272	6,406	6,576	6,634	6,621	6,697	6,716	6,854	6,979	157
gas	1970	2,403	2,519	2,553	2,620	2,668	2,794	2,815	2,887	2,885	2,957	2,970	3,006	3,034	3,059	3,111	3,175	3,161	3,208	3,284	3,310	150
gas	1971	2,556	2,840	3,031	2,993	3,227	3,295	3,399	3,634	3,755	3,992	3,948	3,814	3,844	3,998	4,052	4,123	4,149	4,264	4,301	4,339	158
gas	1972	2,931	2,966	3,182	3,145	3,352	3,409	3,648	3,943	3,889	3,861	3,770	3,870	4,012	4,086	4,167	4,158	4,217	4,262	4,359	4,475	204
gas	1973	3,504	3,790	3,806	4,096	4,343	4,639	4,720	5,011	4,936	5,077	5,163	5,289	5,256	5,473	5,524	5,604	5,659	5,770	5,908	6,044	251
gas	1974	4,733	4,985	5,099	5,455	5,847	5,911	5,932	5,976	6,037	6,169	6,208	6,271	6,301	6,363	6,439	6,439	6,505	6,592	6,694	6,734	275
gas	1975	2,546	2,871	2,938	3,197	3,102	3,100	3,360	3,373	3,501	3,561	3,491	3,601	3,666	3,846	3,938	4,061	4,175	4,336	4,601	4,812	323
gas	1976	1,519	1,687	1,763	2,102	2,269	2,327	2,582	2,693	2,825	2,915	3,189	3,461	3,661	3,784	3,902	3,899	4,022	4,162	4,224	4,362	341
gas	1977	1,301	2,037	2,623	2,836	3,237	3,609	3,876	4,099	4,227	4,429	4,578	4,699	4,892	5,020	5,221	5,429	5,699	5,897	6,133	6,383	505
gas	1978	0	1,105	1,968	2,971	3,255	3,768	4,048	4,130	4,547	4,899	5,024	5,172	5,242	5,231	5,427	5,775	6,072	6,520	6,743	6,946	443

Table 2. Discovery table showing recoverable gas in gas fields based on the Energy Information Administration (1977 through 1996) dataset—Continued.

Comm.	Discovery year	Report year																		No. fields			
		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996		
gas	1979	0	0	1,287	2,176	3,179	3,514	3,912	4,346	4,641	4,770	4,683	4,898	5,017	5,365	5,545	5,796	6,140	6,351	6,780	7,031	486	
gas	1980	0	0	0	862	1,540	2,207	2,274	2,363	2,462	2,495	2,619	2,528	2,565	2,698	2,676	2,671	2,681	2,774	2,987	3,173	475	
gas	1981	0	0	0	0	1,045	1,647	1,641	2,071	2,340	2,404	3,263	3,526	3,952	4,023	4,181	4,590	4,718	4,563	4,780	4,972	543	
gas	1982	0	0	0	0	0	550	1,091	1,510	1,586	1,848	1,977	1,954	2,011	2,129	2,099	2,174	2,255	2,346	2,453	2,566	472	
gas	1983	0	0	0	0	0	0	474	1,073	1,467	1,495	1,280	1,450	1,464	1,826	1,898	2,009	1,468	1,817	2,085	2,298	403	
gas	1984	0	0	0	0	0	0	0	500	1,028	1,333	1,226	1,215	1,181	1,246	1,250	1,295	1,283	1,324	1,310	1,373	448	
gas	1985	0	0	0	0	0	0	0	0	470	972	972	1,147	1,120	1,417	1,720	1,823	1,223	1,669	1,811	2,008	373	
gas	1986	0	0	0	0	0	0	0	0	0	499	691	1,005	1,061	1,180	1,242	1,289	1,178	1,191	1,142	1,334	209	
gas	1987	0	0	0	0	0	0	0	0	0	0	173	468	451	447	463	493	470	583	590	620	191	
gas	1988	0	0	0	0	0	0	0	0	0	0	0	637	1,104	1,282	1,128	1,129	1,134	1,134	1,122	1,092	179	
gas	1989	0	0	0	0	0	0	0	0	0	0	0	0	432	870	683	688	761	884	907	949	156	
gas	1990	0	0	0	0	0	0	0	0	0	0	0	0	0	441	1,109	1,170	1,345	1,734	1,927	2,102	148	
gas	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	246	344	383	460	395	455	120	
gas	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	385	573	605	610	642	117
gas	1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	248	492	620	822	129
gas	1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	381	589	811	149	
gas	1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	486	852	110		
gas	1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	334	69	
Total gas		412,048	420,948	428,948	436,257	447,135	456,527	464,355	470,088	477,219	485,139	491,615	500,269	508,530	517,222	522,835	529,686	537,475	546,391	554,813	565,068		

Table 3. Discovery table showing recoverable oil in oil fields based on the NRG Associates Fields (1982 through 1998) dataset.

[Source of data: NRG Associates, 1999 [includes data current as of December, 1998], The Significant Oil and Gas Fields of the United States. Oil in oil fields in MMBO: conventional, Lower 48 States, onshore, greater than or equal to 1 MMBOE, created 12/4/00. Fields were classified as oil if the field gas-to-oil ratio is less than 20,000 cubic feet per barrel]

Commodity	Discovery year	Report year																	No. fields
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	
oil	1898	14	15	15	15	15	15	15	15	15	15	15	15	16	16	15	15	15	8
oil	1899	3,962	3,967	4,127	4,219	4,280	4,298	4,407	4,481	4,495	4,499	4,491	4,485	4,494	4,496	4,512	4,727	4,819	33
oil	1900	137	141	143	148	148	152	153	153	153	152	150	151	152	153	156	156	161	5
oil	1901	2,718	2,720	2,756	2,861	2,907	2,957	3,138	3,208	3,287	3,337	3,358	3,399	3,419	3,534	3,584	3,714	3,989	9
oil	1902	307	311	313	316	317	318	321	324	328	327	327	329	329	330	332	333	332	5
oil	1903	182	184	186	188	188	190	192	193	193	194	195	196	196	196	194	194	195	9
oil	1904	2,603	2,612	2,639	2,652	2,658	2,663	2,699	2,705	2,712	2,727	2,744	2,773	2,771	2,788	2,799	2,807	2,813	17
oil	1905	435	437	442	445	445	446	447	447	449	449	450	450	447	446	445	447	447	6
oil	1906	522	530	535	538	541	544	549	561	565	570	574	577	576	579	576	580	581	12
oil	1907	135	135	135	136	136	136	136	136	136	136	136	136	136	136	136	136	136	6
oil	1908	1,094	1,100	1,110	1,125	1,128	1,128	1,128	1,139	1,141	1,142	1,143	1,137	1,142	1,145	1,148	1,152	1,151	9
oil	1909	1,202	1,210	1,245	1,265	1,288	1,300	1,335	1,348	1,356	1,364	1,378	1,380	1,393	1,398	1,428	1,468	1,526	9
oil	1910	951	954	962	975	990	1,000	1,021	1,031	1,052	1,083	1,101	1,121	1,155	1,157	1,159	1,196	1,198	8
oil	1911	2,766	2,914	3,064	3,178	3,203	3,280	3,407	3,490	3,503	3,503	3,503	3,550	3,576	3,592	3,679	3,807	3,881	10
oil	1912	1,414	1,437	1,460	1,473	1,477	1,492	1,514	1,524	1,526	1,532	1,519	1,524	1,527	1,531	1,532	1,541	1,546	15
oil	1913	842	846	851	854	856	857	862	866	872	877	882	891	891	894	897	899	900	16
oil	1914	577	592	594	600	601	601	605	613	613	613	614	615	614	616	619	622	622	23
oil	1915	1,757	1,778	1,785	1,812	1,835	1,855	1,869	1,896	1,918	1,922	1,926	1,933	1,945	1,955	1,960	1,957	1,967	19
oil	1916	985	1,006	1,022	1,040	1,042	1,052	1,055	1,065	1,088	1,103	1,111	1,112	1,116	1,119	1,124	1,127	1,127	23
oil	1917	1,026	1,035	1,043	1,057	1,062	1,067	1,097	1,074	1,082	1,088	1,098	1,103	1,102	1,100	1,108	1,113	1,112	28
oil	1918	2,184	2,197	2,228	2,269	2,267	2,293	2,298	2,320	2,333	2,348	2,344	2,346	2,352	2,362	2,368	2,394	2,375	21
oil	1919	1,538	1,543	1,557	1,571	1,573	1,579	1,597	1,596	1,598	1,597	1,597	1,602	1,602	1,605	1,609	1,612	1,606	27
oil	1920	2,340	2,352	2,374	2,384	2,387	2,405	2,420	2,426	2,432	2,424	2,430	2,441	2,443	2,445	2,447	2,455	2,450	30
oil	1921	1,585	1,589	1,594	1,596	1,594	1,596	1,602	1,603	1,607	1,608	1,605	1,608	1,611	1,615	1,626	1,629	1,628	30
oil	1922	4,300	4,321	4,387	4,454	4,541	4,542	4,557	4,552	4,557	4,506	4,506	4,524	4,521	4,530	4,537	4,584	4,565	34
oil	1923	1,618	1,624	1,639	1,649	1,651	1,662	1,686	1,706	1,710	1,728	1,729	1,739	1,767	1,780	1,800	1,824	1,808	28
oil	1924	1,169	1,182	1,199	1,222	1,224	1,226	1,242	1,237	1,239	1,242	1,241	1,248	1,252	1,253	1,257	1,261	1,263	35
oil	1925	1,055	1,075	1,077	1,087	1,096	1,103	1,118	1,145	1,161	1,167	1,161	1,171	1,177	1,193	1,207	1,211	1,209	31
oil	1926	5,819	5,844	5,871	5,917	5,978	6,006	6,038	6,068	6,106	6,128	6,124	6,150	6,158	6,182	6,219	6,235	6,220	59
oil	1927	816	827	839	840	840	839	842	846	848	854	857	858	859	860	861	864	863	40
oil	1928	3,176	3,183	3,217	3,264	3,286	3,311	3,327	3,337	3,342	3,344	3,344	3,342	3,335	3,334	3,340	3,343	3,330	52
oil	1929	4,435	4,453	4,527	4,583	4,582	4,628	4,656	4,685	4,705	4,731	4,741	4,790	4,860	4,842	4,927	5,008	5,016	53
oil	1930	7,403	7,423	7,439	7,472	7,483	7,528	7,577	7,623	7,654	7,632	7,640	7,665	7,991	7,717	7,740	7,748	7,750	35
oil	1931	2,598	2,622	2,631	2,637	2,649	2,656	2,659	2,663	2,657	2,663	2,669	2,672	2,676	2,686	2,698	2,705	2,696	23
oil	1932	1,029	1,040	1,049	1,067	1,075	1,080	1,106	1,130	1,136	1,132	1,134	1,141	1,151	1,156	1,163	1,172	1,171	23
oil	1933	1,431	1,437	1,458	1,466	1,467	1,462	1,464	1,467	1,471	1,478	1,480	1,482	1,483	1,490	1,490	1,495	1,496	21
oil	1934	3,441	3,454	3,523	3,561	3,571	3,593	3,590	3,600	3,618	3,636	3,652	3,664	3,668	3,688	3,709	3,720	3,711	51
oil	1935	1,451	1,465	1,477	1,492	1,497	1,502	1,507	1,507	1,514	1,524	1,526	1,529	1,531	1,540	1,542	1,542	1,537	55
oil	1936	6,374	6,398	6,598	6,998	7,054	7,224	7,378	7,469	7,634	7,681	7,721	7,779	7,739	7,832	7,916	7,873	7,849	64

Table 3. Discovery table showing recoverable oil in oil fields based on the NRG Associates Fields (1982 through 1998) dataset—Continued.

Commodity	Discovery year	Report year															No. fields		
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997		
oil	1937	2,901	2,908	2,935	2,952	2,960	2,964	2,976	2,978	2,981	2,987	2,999	2,996	2,999	3,008	3,018	3,019	88	
oil	1938	3,942	3,954	3,976	3,986	4,001	4,006	4,014	4,025	4,032	4,064	4,089	4,109	4,110	4,118	4,126	4,133	4,127	101
oil	1939	1,063	1,072	1,085	1,091	1,096	1,103	1,114	1,128	1,140	1,151	1,156	1,155	1,158	1,163	1,174	1,186	1,187	68
oil	1940	2,890	2,926	2,962	2,989	2,997	3,015	3,024	3,030	3,049	3,063	3,079	3,089	3,098	3,109	3,118	3,125	3,140	90
oil	1941	1,463	1,476	1,496	1,523	1,531	1,546	1,570	1,598	1,619	1,628	1,634	1,637	1,647	1,668	1,682	1,694	1,694	93
oil	1942	1,239	1,253	1,270	1,281	1,288	1,296	1,319	1,323	1,334	1,347	1,341	1,343	1,345	1,351	1,358	1,362	1,367	84
oil	1943	1,237	1,247	1,256	1,277	1,285	1,303	1,318	1,331	1,341	1,342	1,337	1,344	1,346	1,358	1,373	1,382	1,397	113
oil	1944	2,669	2,709	2,761	2,789	2,818	2,832	2,847	2,853	2,860	2,839	2,833	2,832	2,844	2,845	2,874	2,891	2,908	108
oil	1945	2,193	2,207	2,241	2,284	2,303	2,351	2,371	2,382	2,404	2,430	2,453	2,446	2,475	2,483	2,501	2,516	2,534	86
oil	1946	627	633	642	644	646	649	653	656	661	662	662	664	663	664	666	669	668	79
oil	1947	1,387	1,400	1,413	1,420	1,423	1,460	1,463	1,468	1,478	1,486	1,490	1,507	1,508	1,507	1,504	1,510	1,510	105
oil	1948	2,879	2,922	2,933	2,937	2,931	2,940	2,940	2,953	2,960	2,952	2,953	2,936	2,912	2,908	2,918	2,926	2,926	132
oil	1949	3,663	3,713	3,777	3,858	3,902	3,956	4,008	4,081	4,192	4,274	4,299	4,358	4,401	4,480	4,551	4,616	4,594	149
oil	1950	2,032	2,059	2,084	2,105	2,107	2,167	2,211	2,225	2,244	2,250	2,249	2,224	2,237	2,262	2,274	2,284	2,268	189
oil	1951	1,273	1,285	1,297	1,325	1,339	1,357	1,371	1,389	1,407	1,419	1,405	1,407	1,402	1,406	1,414	1,425	1,428	187
oil	1952	1,200	1,219	1,249	1,263	1,278	1,295	1,301	1,304	1,320	1,331	1,332	1,334	1,335	1,338	1,342	1,350	1,417	185
oil	1953	1,761	1,785	1,816	1,837	1,851	1,862	1,869	1,880	1,896	1,915	1,926	1,936	1,954	1,968	1,988	2,010	2,015	224
oil	1954	840	851	883	899	905	914	919	927	939	954	969	969	971	975	983	992	993	183
oil	1955	991	1,015	1,034	1,045	1,049	1,056	1,065	1,073	1,093	1,094	1,100	1,109	1,122	1,134	1,146	1,153	1,158	208
oil	1956	1,294	1,333	1,350	1,406	1,411	1,426	1,433	1,449	1,468	1,490	1,500	1,525	1,532	1,531	1,552	1,564	1,583	183
oil	1957	916	944	965	973	981	987	998	1,006	1,013	1,019	1,027	1,034	1,036	1,049	1,065	1,077	1,083	172
oil	1958	832	850	866	881	888	899	909	918	924	918	928	930	937	940	950	961	976	144
oil	1959	628	640	652	665	670	674	686	701	708	706	710	712	718	723	731	740	750	150
oil	1960	790	826	845	850	857	862	871	872	863	863	870	873	882	887	894	892	901	105
oil	1961	309	316	330	335	338	342	348	350	354	358	365	366	368	372	381	383	389	112
oil	1962	308	319	326	326	328	329	334	339	346	348	351	352	354	355	358	360	362	110
oil	1963	269	276	287	295	300	305	314	317	320	323	328	332	335	337	343	346	349	89
oil	1964	353	361	368	374	375	379	385	390	411	441	454	449	446	470	493	486	479	97
oil	1965	283	294	306	312	315	318	319	322	326	332	335	337	339	339	344	346	348	85
oil	1966	237	244	250	254	258	261	264	262	260	260	261	263	264	267	271	276	276	82
oil	1967	381	392	394	399	402	406	413	417	423	426	430	429	431	435	438	438	84	
oil	1968	305	309	312	320	323	328	332	333	336	340	345	351	350	351	356	361	368	62
oil	1969	252	256	262	266	271	275	278	281	287	291	291	294	298	300	303	307	308	84
oil	1970	699	711	736	748	751	756	775	785	794	795	807	816	825	833	841	849	853	79
oil	1971	236	233	244	249	251	255	259	262	269	278	287	283	281	292	306	301	295	70
oil	1972	282	285	294	301	312	327	340	345	371	419	398	374	373	370	371	373	371	72
oil	1973	246	266	291	286	288	291	294	295	300	306	309	311	316	327	328	332	321	78
oil	1974	208	242	269	285	294	308	323	325	327	316	316	315	317	318	322	326	330	83
oil	1975	238	254	272	294	299	330	337	341	352	350	345	344	346	352	362	368	380	87
oil	1976	233	250	262	268	273	287	294	300	313	319	324	329	335	345	349	353	352	76
oil	1977	267	299	312	324	322	340	355	370	384	386	396	397	406	412	419	427	445	83

Table 3. Discovery table showing recoverable oil in oil fields based on the NRG Associates Fields (1982 through 1998) dataset—*Continued.*

Commodity	Discovery year	Report year															No. fields	
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	
oil	1978	60	72	92	102	103	107	108	107	113	115	123	117	118	119	122	123	60
oil	1979	103	132	165	178	181	194	199	199	202	203	215	211	220	224	238	258	80
oil	1980	80	97	124	131	134	143	157	159	164	171	170	174	175	176	181	182	81
oil	1981	102	159	185	205	217	231	241	241	247	245	253	260	262	263	272	275	80
oil	1982	33	94	132	148	152	158	168	166	170	165	163	163	166	170	168	172	84
oil	1983	0	24	68	95	119	125	127	131	137	148	160	153	151	153	155	157	52
oil	1984	0	0	30	81	105	128	149	154	159	159	158	165	165	169	170	173	68
oil	1985	0	0	0	24	63	100	134	160	174	156	166	170	169	162	169	175	59
oil	1986	0	0	0	0	11	31	44	54	61	62	66	66	66	68	72	73	36
oil	1987	0	0	0	0	0	20	59	75	91	93	89	83	83	80	83	80	42
oil	1988	0	0	0	0	0	0	14	34	54	64	71	63	63	61	64	65	42
oil	1989	0	0	0	0	0	0	0	16	42	61	71	61	61	66	70	75	28
oil	1990	0	0	0	0	0	0	0	0	7	19	31	43	41	39	40	40	23
oil	1991	0	0	0	0	0	0	0	0	0	15	36	47	54	56	59	58	22
oil	1992	0	0	0	0	0	0	0	0	0	0	8	19	26	42	48	42	14
oil	1993	0	0	0	0	0	0	0	0	0	0	0	5	12	16	21	23	13
oil	1994	0	0	0	0	0	0	0	0	0	0	0	0	4	24	49	85	16
oil	1995	0	0	0	0	0	0	0	0	0	0	0	0	0	6	17	22	13
oil	1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	20	14
oil	1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	19
oil	1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total oil		123,585	125,065	127,210	129,306	130,231	131,576	133,221	134,323	135,517	136,195	136,663	137,243	138,020	138,518	139,637	140,881	141,575

Table 4. Discovery table showing recoverable gas in gas fields based on the NRG Associates Fields (1982 through 1998) dataset.

[Source of data: NRG Associates, 1999 [includes data current as of December, 1998], The Significant Oil and Gas Fields of the United States. Gas in gas fields in BCFG: conventional, Lower 48 States, onshore, greater than or equal to 1 MMBOE, created 12/4/00. Fields were classified as gas if the field gas-to-oil ratio is 20,000 cubic feet per barrel or more]

Commodity	Discovery year	Report year															No. fields	
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	
gas	1898	5	5	5	6	6	6	6	6	7	7	7	7	7	7	7	8	1
gas	1899	177	177	178	178	178	179	180	182	182	185	188	196	200	199	204	203	206
gas	1900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
gas	1901	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
gas	1902	29	30	30	29	30	36	38	39	42	41	41	41	43	52	65	65	63
gas	1903	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
gas	1904	1,876	1,951	1,981	2,026	2,071	2,431	2,476	2,446	2,491	2,536	2,746	2,821	2,791	2,791	2,821	2,971	3,061
gas	1905	120	120	120	120	120	121	121	121	121	121	121	121	121	121	121	121	1
gas	1906	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
gas	1907	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
gas	1908	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
gas	1909	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
gas	1910	76	75	76	76	75	76	77	76	77	77	76	77	77	78	78	78	2
gas	1911	37	38	38	38	38	48	54	54	57	57	59	60	58	58	58	58	57
gas	1912	1,091	1,091	1,152	1,155	1,155	1,433	1,616	1,625	1,631	1,707	1,823	1,948	2,173	2,145	2,096	2,177	2,276
gas	1913	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	2
gas	1914	301	301	301	300	301	301	304	304	305	317	329	344	358	368	368	372	395
gas	1915	336	336	333	345	345	345	348	348	351	351	351	354	354	356	356	358	1
gas	1916	11,917	11,917	12,002	12,071	12,149	12,306	12,611	12,687	12,809	12,907	12,908	13,000	13,087	13,234	13,223	13,303	13,429
gas	1917	277	275	278	281	291	296	299	308	309	312	315	314	315	315	315	318	320
gas	1918	78,417	78,491	79,196	79,961	80,825	80,576	80,562	80,991	81,065	81,763	82,512	82,679	83,358	83,746	84,267	83,636	83,675
gas	1919	73	73	73	75	78	81	99	108	113	114	119	121	129	134	134	136	172
gas	1920	175	172	175	170	171	173	176	177	178	183	186	184	182	182	184	183	185
gas	1921	599	596	597	596	601	603	612	617	627	639	661	658	653	658	645	653	646
gas	1922	4,540	4,543	4,564	4,574	4,586	4,586	4,676	4,760	4,784	4,820	4,838	4,896	4,985	5,031	5,072	5,086	5,041
gas	1923	638	652	658	670	671	684	700	702	692	686	697	698	686	689	692	700	710
gas	1924	5,262	5,388	5,412	5,457	5,502	5,636	6,069	6,265	6,322	6,397	6,755	6,623	6,336	6,788	6,863	7,013	7,059
gas	1925	70	61	65	65	68	68	74	75	75	77	78	82	87	98	127	154	187
gas	1926	920	920	919	926	936	950	967	993	996	1,000	1,014	1,010	1,020	986	1,036	1,048	1,036
gas	1927	968	972	978	981	999	1,013	1,024	1,028	1,054	1,056	1,048	1,048	1,057	1,043	1,060	1,066	9
gas	1928	6,051	6,090	6,092	5,778	5,797	5,814	5,839	5,861	5,928	5,972	5,973	5,968	5,981	6,009	6,036	6,058	6,061
gas	1929	1,920	2,007	2,009	2,111	2,141	2,244	2,514	2,889	3,126	2,993	2,893	2,869	2,809	2,875	2,911	2,947	3,041
gas	1930	5,855	5,795	6,051	6,260	6,252	6,278	6,326	6,495	6,568	6,840	6,893	6,969	6,998	7,047	7,113	7,181	7,292
gas	1931	494	488	487	487	487	487	492	492	498	501	499	499	501	489	496	500	501
gas	1932	2,044	2,044	2,044	2,045	2,045	2,054	2,060	2,057	2,058	2,058	2,055	2,057	2,058	2,059	2,058	2,060	2,059
gas	1933	811	816	818	872	911	942	953	953	950	932	962	974	984	973	999	988	999
gas	1934	6,859	6,859	6,859	6,859	6,863	6,900	7,071	7,161	7,141	7,199	7,186	7,117	7,112	7,130	7,212	7,298	7,427
gas	1935	8,967	9,065	9,066	9,025	8,984	8,995	8,853	8,895	8,747	8,659	8,695	8,672	8,689	8,698	8,707	8,714	8,787
gas	1936	16,498	16,805	16,861	17,037	17,198	17,397	17,572	18,455	18,824	18,739	18,984	19,119	19,281	19,873	20,591	21,159	21,630

Table 4. Discovery table showing recoverable gas in gas fields based on the NRG Associates Fields (1982 through 1998) dataset—Continued.

Commodity	Discovery year	Report year													No. fields				
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	
gas	1937	11,690	11,715	11,782	11,895	11,985	12,154	12,259	12,322	12,397	12,380	12,315	12,361	12,386	12,395	12,444	12,475	12,552	18
gas	1938	7,003	7,032	7,168	7,239	7,226	7,216	7,291	7,453	7,539	7,545	7,606	7,751	7,840	7,918	8,069	8,160	8,132	25
gas	1939	6,619	6,627	6,643	6,630	6,637	6,662	6,690	6,702	6,724	6,766	6,788	6,784	6,852	6,906	6,969	6,954	6,874	20
gas	1940	3,609	3,623	3,644	3,657	3,657	3,678	3,668	3,684	3,692	3,681	3,703	3,717	3,724	3,741	3,761	3,789	3,820	15
gas	1941	7,150	7,188	7,316	7,335	7,338	7,385	7,419	7,406	7,385	7,415	7,413	7,430	7,494	7,577	7,684	7,725	7,811	26
gas	1942	3,136	3,209	3,200	3,203	3,211	3,231	3,323	3,376	3,472	3,524	3,533	3,510	3,569	3,872	4,014	4,042	4,110	32
gas	1943	5,554	5,569	5,640	5,684	5,761	5,840	5,928	5,967	5,999	5,984	6,011	6,034	5,986	6,080	6,142	6,242	6,473	39
gas	1944	5,503	5,550	5,567	5,583	5,631	5,672	5,746	5,773	5,847	5,813	5,848	5,872	5,889	5,913	5,958	5,974	6,013	54
gas	1945	7,031	7,063	7,130	7,226	7,235	7,371	7,451	7,487	7,507	7,558	7,628	7,727	7,857	7,792	7,896	7,999	8,114	46
gas	1946	4,156	4,194	4,257	4,287	4,290	4,322	4,264	4,381	4,194	4,219	4,259	4,215	4,213	4,253	4,350	4,405	4,397	39
gas	1947	4,384	4,404	4,420	4,463	4,491	4,495	4,555	4,527	4,604	4,649	4,681	4,663	4,748	4,848	4,938	4,951	5,037	41
gas	1948	7,872	7,983	8,052	8,261	8,473	8,560	8,490	8,630	8,659	8,684	8,703	8,868	8,898	9,107	9,322	9,588	9,673	50
gas	1949	9,403	9,443	9,393	9,310	9,316	9,255	9,329	9,448	9,524	9,483	9,501	9,632	9,689	9,795	9,923	10,086	10,202	57
gas	1950	4,558	4,625	4,700	4,786	4,858	4,918	4,986	5,000	5,101	5,109	5,110	5,185	5,199	5,234	5,285	5,343	5,385	43
gas	1951	5,987	6,047	6,190	6,341	6,468	6,553	6,743	7,026	7,322	7,294	7,423	7,659	7,925	7,788	7,987	8,130	8,259	59
gas	1952	10,308	10,477	10,595	10,589	10,650	10,632	10,690	10,805	10,922	11,041	11,310	11,706	11,785	11,800	12,039	12,360	13,057	81
gas	1953	6,481	6,753	7,224	7,436	7,614	7,706	7,749	7,658	7,566	7,642	7,653	7,654	7,737	7,815	7,884	7,929	8,018	86
gas	1954	7,327	7,403	7,740	7,961	8,082	8,240	8,422	8,519	8,717	8,875	9,017	9,075	9,165	9,247	9,322	9,345	9,494	96
gas	1955	3,532	3,603	3,682	3,815	4,064	4,332	4,677	4,882	4,972	5,096	5,275	5,300	5,329	5,379	5,531	5,695	5,855	88
gas	1956	9,663	9,805	9,964	10,081	10,213	10,614	10,675	10,858	10,855	10,916	11,056	11,095	11,239	11,388	11,438	11,581	11,551	91
gas	1957	10,897	10,918	11,073	11,285	11,499	11,659	11,932	12,354	12,607	12,680	12,728	12,788	12,934	13,183	13,471	13,731	14,560	108
gas	1958	9,365	9,564	9,653	9,822	9,877	9,934	10,042	10,271	10,447	10,584	10,686	10,851	10,993	11,032	11,043	11,073	11,147	99
gas	1959	5,006	5,101	5,325	5,475	5,583	5,691	5,852	6,018	6,098	6,159	6,202	6,307	6,363	6,546	6,824	7,325	7,509	100
gas	1960	4,720	4,751	4,911	5,054	5,146	5,364	5,555	5,664	5,822	6,075	6,236	6,403	6,520	6,692	6,846	7,069	7,378	90
gas	1961	5,010	5,176	5,574	5,671	5,751	5,819	5,996	6,260	6,347	6,565	6,659	6,832	6,976	7,121	7,314	7,389	7,431	90
gas	1962	6,038	6,161	6,270	6,381	6,383	6,465	6,624	6,879	7,016	7,143	7,392	7,676	7,990	8,152	8,216	8,327	8,507	71
gas	1963	7,284	7,321	7,397	7,524	7,511	7,527	7,570	7,404	7,555	7,676	7,827	7,912	8,100	8,133	8,431	8,499	8,627	52
gas	1964	3,600	3,658	3,741	3,856	4,056	4,146	4,380	4,887	4,954	5,084	5,210	5,404	5,521	5,759	5,934	6,084	6,302	59
gas	1965	2,881	2,924	2,938	2,932	2,934	3,233	3,002	3,059	3,144	3,165	3,210	3,265	3,296	3,384	3,506	3,592	3,705	70
gas	1966	3,034	3,140	3,283	3,369	3,452	3,611	3,813	4,010	4,159	4,290	4,377	4,620	4,701	4,829	4,990	5,110	5,310	66
gas	1967	2,582	2,595	2,653	2,835	2,849	2,908	2,972	3,067	3,178	3,208	3,296	3,379	3,445	3,494	3,555	3,541	3,588	63
gas	1968	2,835	2,843	2,856	2,900	2,989	3,065	3,110	3,092	3,076	3,154	3,202	3,268	3,322	3,358	3,425	3,468	3,517	46
gas	1969	2,568	2,590	2,624	2,662	2,714	2,815	2,942	2,960	3,032	3,053	3,071	3,115	3,103	3,154	3,172	3,228	3,236	42
gas	1970	1,662	1,694	1,739	1,792	2,037	2,067	2,083	2,119	2,193	2,116	2,109	2,151	2,158	2,168	2,206	2,228	2,306	50
gas	1971	3,013	3,132	3,252	3,309	3,626	3,695	3,915	4,115	4,316	4,406	4,418	4,603	4,778	4,861	4,948	5,117	5,365	56
gas	1972	3,226	3,261	3,376	3,418	3,521	3,511	3,583	3,640	3,667	3,704	3,764	3,741	3,800	3,814	3,885	3,947	3,962	73
gas	1973	3,388	3,383	3,452	3,503	3,553	3,631	3,767	3,795	3,798	3,833	3,881	3,989	3,983	3,997	4,058	4,116	4,169	95
gas	1974	2,648	2,793	3,118	3,325	3,398	3,460	3,448	3,567	3,522	3,586	3,708	3,781	3,869	3,934	3,967	4,011	4,230	89
gas	1975	1,882	1,938	2,041	2,184	2,282	2,344	2,448	2,457	2,536	2,557	2,620	2,671	2,776	2,877	3,075	3,377	3,479	86
gas	1976	1,997	2,065	2,143	2,179	2,277	2,311	2,443	2,549	2,782	2,885	2,933	2,941	2,999	3,149	3,172	3,212	3,316	85
gas	1977	3,499	4,053	4,334	4,585	4,748	4,873	5,215	5,498	5,760	5,742	5,882	6,017	6,177	6,310	6,513	6,869	7,374	89

Table 4. Discovery table showing recoverable gas in gas fields based on the NRG Associates Fields (1982 through 1998) dataset—Continued.

Commodity	Discovery year	Report year													No. fields				
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	
gas	1978	1,906	1,993	2,169	2,293	2,531	2,763	2,830	2,757	2,837	2,952	3,060	3,130	3,222	3,171	3,206	3,362	3,753	86
gas	1979	3,467	3,939	4,154	4,816	5,045	5,259	4,989	5,353	5,338	5,622	5,629	6,039	6,237	6,746	6,925	7,152	7,528	102
gas	1980	1,951	2,237	2,502	2,648	2,892	3,077	3,311	3,692	3,659	3,846	4,029	4,097	4,121	4,233	4,527	4,648	4,896	76
gas	1981	760	1,181	1,389	1,538	1,590	1,631	1,728	1,801	1,824	1,960	2,091	2,189	2,211	2,249	2,466	2,622	2,703	81
gas	1982	124	512	986	1,374	1,549	1,659	1,822	1,832	1,883	1,902	1,987	2,075	2,125	2,127	2,151	2,241	2,420	69
gas	1983	0	94	408	638	713	845	884	994	1,014	989	1,030	1,038	1,079	1,102	1,188	1,262	1,346	45
gas	1984	0	0	271	549	858	1,079	1,110	1,086	1,070	958	982	977	993	1,009	1,064	1,125	1,126	50
gas	1985	0	0	0	111	324	421	403	438	498	495	550	571	627	703	844	881	1,013	36
gas	1986	0	0	0	0	47	152	294	386	386	407	442	429	402	400	390	425	490	18
gas	1987	0	0	0	0	0	74	167	257	303	327	328	310	302	315	377	384	387	25
gas	1988	0	0	0	0	0	0	501	928	975	909	875	815	776	758	789	798	818	28
gas	1989	0	0	0	0	0	0	0	237	514	819	1,038	1,177	1,197	1,246	1,316	1,225	1,280	34
gas	1990	0	0	0	0	0	0	0	0	50	469	657	786	1,044	1,219	1,485	1,526	1,570	22
gas	1991	0	0	0	0	0	0	0	0	0	126	280	376	353	375	398	373	396	19
gas	1992	0	0	0	0	0	0	0	0	0	0	79	265	358	383	399	342	345	20
gas	1993	0	0	0	0	0	0	0	0	0	0	0	60	191	282	353	354	365	17
gas	1994	0	0	0	0	0	0	0	0	0	0	0	0	81	228	358	517	773	18
gas	1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	111	786	957	982
gas	1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	118	324	300	22
gas	1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	114	426	18
gas	1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	212	14
Total gas		383,741	389,512	397,386	404,413	410,838	417,013	423,881	432,529	437,511	442,395	448,342	453,838	459,166	465,711	474,591	481,356	490,949	

Table 5. Discovery table showing recoverable oil in oil reservoirs based on the NRG Associates Reservoirs (1982 through 1998) dataset.

[Source of data: NRG Associates, 1999 [includes data current as of December, 1998], The Significant Oil and Gas Fields of the United States. Oil in oil reservoirs in MMBO: conventional, Lower 48 States, onshore, greater than or equal to 1 MMBOE, created 12/4/00. Fields were classified as oil if the field gas-to-oil ratio is less than 20,000 cubic feet per barrel]

Commodity	Discovery year	Report year																	No. reservoirs
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	
oil	1898	51	64	70	70	70	74	78	78	76	74	75	75	74	74	74	77	78	24
oil	1899	2,268	2,269	2,372	2,430	2,471	2,477	2,546	2,597	2,598	2,597	2,591	2,584	2,591	2,581	2,581	2,782	2,882	22
oil	1900	808	809	849	874	894	905	935	955	965	965	965	965	975	990	1,000	990	6	
oil	1901	2,069	2,069	2,102	2,206	2,251	2,300	2,480	2,549	2,627	2,675	2,695	2,734	2,754	2,868	2,916	3,045	3,318	3
oil	1902	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
oil	1903	105	105	107	108	108	109	111	112	112	112	113	113	113	114	111	111	111	
oil	1904	188	189	189	191	191	191	192	192	192	193	193	193	193	193	193	193	193	
oil	1905	55	55	58	58	58	58	58	58	60	60	60	60	57	56	54	54	54	
oil	1906	97	97	100	100	99	100	101	103	104	106	107	109	109	109	106	106	106	
oil	1907	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	
oil	1908	629	632	639	647	648	648	646	656	656	658	657	650	656	658	660	661	661	
oil	1909	409	411	431	446	469	481	510	524	529	536	552	551	564	566	588	618	640	
oil	1910	675	675	690	690	700	708	721	731	742	773	784	807	822	822	818	853	854	
oil	1911	1,445	1,585	1,716	1,818	1,844	1,920	2,040	2,120	2,077	2,079	2,079	2,099	2,117	2,127	2,224	2,364	2,449	
oil	1912	167	179	197	198	201	213	233	233	232	232	222	222	222	222	219	220	223	
oil	1913	25	25	25	25	30	33	39	39	39	40	41	40	52	52	55	55	55	
oil	1914	57	57	57	58	58	58	59	61	61	61	61	61	61	60	60	61	3	
oil	1915	333	336	339	341	362	362	366	377	394	392	392	392	392	392	390	393	391	
oil	1916	22	22	23	23	23	24	24	24	24	26	25	25	25	25	25	26	5	
oil	1917	224	225	227	228	231	235	239	240	244	246	246	249	250	253	258	263	268	
oil	1918	293	293	299	300	300	305	308	311	314	315	311	313	313	313	315	320	319	
oil	1919	970	975	986	999	1,000	1,003	1,016	1,011	1,011	1,005	997	997	998	998	1,000	1,002	1,000	
oil	1920	754	758	769	777	777	782	788	794	799	800	803	814	816	821	819	815	811	
oil	1921	1,017	1,018	1,023	1,026	1,027	1,029	1,034	1,034	1,034	1,029	1,029	1,030	1,031	1,034	1,043	1,044	1,044	
oil	1922	3,794	3,802	3,857	3,921	4,008	4,009	4,026	4,026	4,027	3,971	3,982	3,993	3,990	4,002	4,010	4,056	4,040	
oil	1923	946	950	956	958	955	962	981	1,000	1,002	1,019	1,023	1,029	1,053	1,064	1,077	1,096	1,075	
oil	1924	509	511	517	521	522	526	541	535	535	535	533	538	541	542	543	543	15	
oil	1925	1,757	1,773	1,782	1,812	1,818	1,823	1,838	1,882	1,897	1,910	1,914	1,923	1,933	1,953	1,970	1,986	1,968	
oil	1926	4,207	4,220	4,237	4,275	4,328	4,348	4,371	4,400	4,431	4,443	4,441	4,467	4,470	4,496	4,520	4,527	4,505	
oil	1927	556	565	572	578	578	580	583	585	588	588	591	596	597	598	599	602	604	
oil	1928	1,996	2,008	2,039	2,085	2,096	2,121	2,139	2,154	2,155	2,161	2,159	2,157	2,150	2,147	2,149	2,153	2,139	
oil	1929	2,300	2,317	2,369	2,413	2,410	2,441	2,448	2,460	2,468	2,656	2,492	2,521	2,572	2,548	2,594	2,644	2,638	
oil	1930	7,134	7,154	7,173	7,203	7,212	7,252	7,290	7,339	7,387	7,356	7,356	7,363	7,402	7,423	7,437	7,450	7,445	
oil	1931	1,667	1,689	1,698	1,711	1,714	1,730	1,722	1,721	1,715	1,713	1,703	1,702	1,708	1,714	1,723	1,716	17	
oil	1932	574	580	581	585	588	590	603	613	617	616	616	620	628	629	634	639	15	
oil	1933	1,460	1,464	1,481	1,488	1,488	1,484	1,487	1,489	1,491	1,498	1,500	1,502	1,503	1,510	1,509	1,514	1,515	
oil	1934	2,263	2,266	2,304	2,325	2,332	2,350	2,349	2,359	2,371	2,381	2,384	2,394	2,397	2,412	2,421	2,423	31	
oil	1935	1,027	1,039	1,045	1,058	1,063	1,067	1,070	1,070	1,078	1,087	1,086	1,087	1,090	1,097	1,098	1,093	33	
oil	1936	5,461	5,445	5,617	5,962	6,005	6,127	6,249	6,320	6,459	6,495	6,505	6,547	6,537	6,593	6,660	6,590	54	

Table 5. Discovery table showing recoverable oil in oil reservoirs based on the NRG Associates Reservoirs (1982 through 1998) dataset—Continued.

Commodity	Discovery year	Report year													No. reservoirs				
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	
oil	1937	1,294	1,294	1,313	1,322	1,328	1,332	1,336	1,332	1,333	1,333	1,333	1,340	1,337	1,339	1,341	1,346	1,342	57
oil	1938	2,149	2,158	2,175	2,185	2,190	2,193	2,191	2,197	2,198	2,209	2,211	2,217	2,217	2,221	2,224	2,233	2,230	66
oil	1939	1,060	1,063	1,075	1,085	1,093	1,100	1,114	1,132	1,145	1,169	1,162	1,170	1,165	1,170	1,178	1,187	1,184	62
oil	1940	1,627	1,659	1,709	1,758	1,763	1,803	1,813	1,814	1,821	1,829	1,838	1,858	1,826	1,837	1,845	1,851	1,855	70
oil	1941	1,702	1,710	1,734	1,756	1,759	1,768	1,792	1,812	1,870	1,870	1,877	1,900	1,916	1,930	1,924	1,917	1,905	77
oil	1942	1,157	1,196	1,215	1,214	1,222	1,223	1,239	1,245	1,258	1,272	1,268	1,270	1,274	1,282	1,290	1,294	1,302	66
oil	1943	1,152	1,163	1,171	1,186	1,187	1,194	1,205	1,219	1,231	1,232	1,230	1,237	1,240	1,254	1,266	1,274	1,275	95
oil	1944	2,315	2,363	2,401	2,443	2,470	2,505	2,536	2,562	2,585	2,563	2,562	2,563	2,574	2,597	2,624	2,634	2,642	100
oil	1945	1,283	1,300	1,317	1,334	1,338	1,347	1,359	1,367	1,384	1,398	1,411	1,409	1,420	1,443	1,468	1,500	1,529	93
oil	1946	1,303	1,324	1,354	1,369	1,372	1,383	1,389	1,395	1,404	1,413	1,426	1,426	1,428	1,439	1,457	1,467	1,469	94
oil	1947	978	981	995	1,009	1,007	1,044	1,062	1,065	1,103	1,089	1,090	1,108	1,109	1,129	1,131	1,149	1,158	129
oil	1948	3,017	3,061	3,068	3,074	3,067	3,072	3,051	3,062	3,039	3,049	3,042	3,029	3,005	2,980	2,994	3,002	3,002	143
oil	1949	2,410	2,448	2,507	2,552	2,579	2,616	2,653	2,711	2,760	2,816	2,836	2,862	2,912	2,978	3,092	3,125	3,118	160
oil	1950	2,039	2,070	2,103	2,147	2,159	2,247	2,296	2,311	2,328	2,698	2,340	2,295	2,320	2,341	2,364	2,386	2,361	217
oil	1951	1,336	1,352	1,363	1,391	1,402	1,418	1,431	1,447	1,465	1,478	1,464	1,469	1,465	1,468	1,475	1,484	1,486	211
oil	1952	1,185	1,195	1,213	1,224	1,233	1,245	1,254	1,255	1,260	1,263	1,267	1,267	1,269	1,272	1,276	1,282	1,283	214
oil	1953	1,579	1,602	1,629	1,654	1,669	1,680	1,687	1,701	1,716	1,732	1,742	1,751	1,764	1,777	1,796	1,807	1,808	278
oil	1954	1,442	1,465	1,487	1,510	1,519	1,534	1,545	1,554	1,575	1,593	1,599	1,601	1,611	1,617	1,622	1,636	1,636	251
oil	1955	1,513	1,540	1,557	1,564	1,571	1,577	1,587	1,602	1,635	1,643	1,644	1,666	1,669	1,685	1,695	1,699	1,695	245
oil	1956	1,321	1,359	1,376	1,427	1,429	1,442	1,449	1,465	1,482	1,501	1,506	1,526	1,535	1,532	1,549	1,559	1,578	236
oil	1957	1,201	1,232	1,257	1,258	1,262	1,266	1,277	1,286	1,302	1,321	1,332	1,342	1,351	1,372	1,386	1,394	1,399	214
oil	1958	632	652	664	680	690	698	708	717	724	719	729	735	738	739	747	752	757	191
oil	1959	653	663	678	695	699	707	716	722	726	727	735	741	736	738	740	745	751	164
oil	1960	712	723	744	749	756	762	772	778	783	785	790	801	804	805	812	819	823	124
oil	1961	329	335	344	350	354	359	369	371	377	380	386	394	405	405	415	417	420	156
oil	1962	470	486	504	504	504	506	512	520	528	532	532	535	539	538	545	553	555	142
oil	1963	276	283	291	299	302	305	310	312	317	321	327	328	333	335	342	345	344	129
oil	1964	488	490	497	504	505	510	516	522	544	574	587	584	582	608	633	627	622	146
oil	1965	336	347	360	366	368	369	373	374	381	387	389	391	392	392	399	401	401	121
oil	1966	313	325	334	345	352	357	366	374	368	363	365	361	364	368	374	381	382	110
oil	1967	401	412	414	420	419	422	424	428	431	438	439	440	440	441	444	447	447	95
oil	1968	342	346	346	348	351	356	361	360	363	364	369	371	371	373	378	382	389	80
oil	1969	363	368	375	378	382	387	394	400	409	408	413	410	414	419	425	431	433	113
oil	1970	700	712	737	749	754	761	778	790	801	800	810	816	827	834	844	853	868	90
oil	1971	449	453	469	503	511	525	528	532	550	572	586	590	580	590	601	597	588	94
oil	1972	344	345	354	361	370	385	396	400	427	474	450	424	418	415	416	412	405	92
oil	1973	340	349	365	378	380	381	384	383	382	388	392	394	396	407	407	408	397	96
oil	1974	208	241	270	288	297	309	322	323	325	314	317	318	318	320	326	328	330	95
oil	1975	237	252	295	323	326	356	359	364	374	372	365	364	365	371	380	384	392	101
oil	1976	156	170	171	174	175	177	184	186	192	198	202	202	203	205	212	216	79	
oil	1977	284	320	345	357	355	367	378	391	403	405	415	418	426	432	439	449	467	96

Table 5. Discovery table showing recoverable oil in oil reservoirs based on the NRG Associates Reservoirs (1982 through 1998) dataset—Continued.

Commodity	Discovery year	Report year															No. reservoirs		
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	
oil	1978	137	151	164	171	172	181	182	181	191	194	199	201	205	212	218	220	220	79
oil	1979	140	153	179	190	192	199	198	196	203	205	216	211	222	227	235	242	249	109
oil	1980	97	121	144	150	156	169	180	179	190	196	197	201	202	206	212	214	214	104
oil	1981	105	158	181	199	206	217	229	233	231	223	232	239	246	248	255	255	261	103
oil	1982	37	109	143	158	164	171	183	180	181	175	172	173	175	175	179	178	181	104
oil	1983	0	47	114	131	147	160	164	167	177	188	198	192	194	196	198	203	208	84
oil	1984	0	0	40	97	120	144	164	170	176	177	179	185	186	190	191	193	196	89
oil	1985	0	0	0	42	93	137	170	198	214	198	202	207	203	199	204	211	214	86
oil	1986	0	0	0	0	15	40	56	68	87	94	97	96	95	96	100	102	111	60
oil	1987	0	0	0	0	0	24	72	91	109	110	113	108	107	103	105	103	107	61
oil	1988	0	0	0	0	0	0	18	48	72	84	90	86	87	84	89	90	96	58
oil	1989	0	0	0	0	0	0	0	18	48	68	74	69	67	71	74	79	75	42
oil	1990	0	0	0	0	0	0	0	0	13	28	39	51	51	49	48	49	50	28
oil	1991	0	0	0	0	0	0	0	0	0	18	43	48	53	55	58	57	60	31
oil	1992	0	0	0	0	0	0	0	0	0	0	10	23	31	44	50	51	49	23
oil	1993	0	0	0	0	0	0	0	0	0	0	0	11	19	26	34	37	42	22
oil	1994	0	0	0	0	0	0	0	0	0	0	0	0	7	35	68	118	130	26
oil	1995	0	0	0	0	0	0	0	0	0	0	0	0	0	17	30	36	39	21
oil	1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	26	41	19
oil	1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	47	28
oil	1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3
Total oil		89,937	91,190	93,050	94,892	95,676	96,868	98,266	99,275	100,315	101,366	101,135	101,559	101,958	102,659	103,660	104,777	105,316	

Table 6. Discovery table showing recoverable gas in gas reservoirs based on the NRG Associates Reservoirs (1982 through 1998) dataset.

[Source of data: NRG Associates, 1999 [includes data current as of December, 1998]. The Significant Oil and Gas Fields of the United States. Gas in gas reservoirs in BCFG: conventional, Lower 48 States, onshore, greater than or equal to 1 MMBOE, created 12/4/00. Fields were classified as gas if the field gas-to-oil ratio is 20,000 cubic feet per barrel or more]

Commodity	Discovery year	Report year															No. reservoirs		
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997		
gas	1898	450	454	470	471	476	473	489	489	501	517	531	541	532	561	578	586	616	13
gas	1899	161	161	161	161	161	162	162	162	162	164	168	173	172	176	171	171	2	
gas	1900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
gas	1901	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
gas	1902	29	30	30	29	30	36	38	39	42	41	41	41	43	52	65	65	63	1
gas	1903	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
gas	1904	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
gas	1905	120	120	120	120	120	121	121	121	121	121	121	121	121	121	121	121	1	
gas	1906	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
gas	1907	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
gas	1908	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
gas	1909	93	93	93	93	93	93	93	93	95	95	96	96	98	98	98	101	101	1
gas	1910	76	75	76	76	75	76	77	76	77	77	76	77	77	78	78	78	78	2
gas	1911	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
gas	1912	25	25	25	25	25	25	25	26	26	25	25	26	28	29	30	30	28	2
gas	1913	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
gas	1914	113	113	114	114	114	114	115	116	116	115	115	115	115	115	115	115	2	
gas	1915	0	0	0	0	0	0	0	1	0	0	0	0	4	3	4	5	1	
gas	1916	196	195	194	195	195	195	195	195	195	195	195	195	195	196	196	196	3	
gas	1917	24	24	24	24	24	24	24	24	24	24	24	24	26	25	25	25	2	
gas	1918	71,732	71,762	72,452	73,143	73,917	73,706	73,719	74,137	74,197	74,863	75,618	75,690	76,307	76,731	77,020	76,626	76,494	7
gas	1919	393	393	393	396	399	402	419	428	379	380	394	369	341	354	348	361	388	6
gas	1920	182	181	181	175	175	175	177	177	178	180	180	181	181	182	184	183	184	3
gas	1921	135	134	134	135	138	139	138	138	138	138	135	139	141	141	142	144	143	4
gas	1922	306	306	307	306	306	307	322	327	322	322	325	319	326	322	327	330	326	7
gas	1923	53	53	54	54	54	56	61	61	60	60	60	58	59	60	62	67	66	4
gas	1924	402	404	405	405	406	406	407	411	414	414	412	415	416	432	436	435	435	10
gas	1925	93	93	94	96	96	96	96	96	96	96	96	97	96	97	97	97	97	4
gas	1926	296	296	296	300	296	297	305	318	316	312	314	316	321	318	327	335	331	6
gas	1927	437	438	442	441	450	457	459	457	473	474	478	477	482	468	476	481	479	6
gas	1928	161	161	164	163	162	163	164	163	162	164	165	165	164	164	165	165	166	7
gas	1929	416	476	475	464	467	471	448	435	423	434	431	414	418	406	415	415	414	9
gas	1930	5,495	5,495	5,493	5,269	5,314	5,343	5,379	5,381	5,468	5,529	5,504	5,516	5,525	5,551	5,576	5,585	5,585	12
gas	1931	262	256	256	257	260	265	269	270	276	279	271	272	275	272	273	272	274	6
gas	1932	2,073	2,074	2,073	2,072	2,072	2,081	2,087	2,084	2,084	2,085	2,083	2,084	2,086	2,086	2,088	2,087	6	
gas	1933	2,098	2,103	2,101	2,154	2,194	2,224	2,233	2,239	2,241	2,248	2,268	2,288	2,291	2,286	2,314	2,310	2,325	8
gas	1934	470	469	471	471	471	471	471	471	472	472	472	476	478	476	478	478	480	9
gas	1935	7,634	7,705	7,698	7,700	7,701	7,707	7,557	7,576	7,419	7,362	7,396	7,382	7,385	7,371	7,376	7,381	7,409	14
gas	1936	10,701	10,716	10,712	10,723	10,725	10,745	10,764	10,792	10,796	10,787	10,807	10,822	10,848	10,880	10,901	10,917	10,935	17

Table 6. Discovery table showing recoverable gas in gas reservoirs based on the NRG Associates Reservoirs (1982 through 1998) dataset—Continued.

Commodity	Discovery year	Report year													No. reservoirs				
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	
gas	1937	2,594	2,597	2,625	2,617	2,624	2,633	2,647	2,657	2,654	2,651	2,662	2,664	2,672	2,674	2,687	2,672	2,676	18
gas	1938	4,587	4,610	4,640	4,637	4,638	4,638	4,669	4,690	4,704	4,740	4,759	4,779	4,788	4,810	4,863	4,907	4,884	29
gas	1939	4,954	4,968	4,987	5,005	5,029	5,078	5,164	5,224	5,232	5,226	5,240	5,253	5,274	5,289	5,302	5,296	5,323	27
gas	1940	4,205	4,214	4,243	4,249	4,258	4,274	4,323	4,346	4,363	4,414	4,440	4,498	4,534	4,660	4,642	4,586	4,597	26
gas	1941	2,159	2,158	2,159	2,170	2,171	2,187	2,188	2,210	2,218	2,214	2,198	2,215	2,209	2,227	2,226	2,253	2,251	24
gas	1942	1,521	1,606	1,622	1,609	1,614	1,629	1,651	1,665	1,682	1,772	1,825	1,842	1,850	1,871	1,966	2,049	2,134	29
gas	1943	1,843	1,846	1,856	1,860	1,858	1,868	1,878	1,887	1,896	1,906	1,915	1,924	1,938	1,964	1,975	1,979	1,983	41
gas	1944	5,520	5,536	5,646	5,793	5,839	5,981	5,997	6,020	6,048	6,011	6,000	6,048	6,050	6,039	6,012	6,002	6,025	50
gas	1945	5,288	5,299	5,349	5,330	5,350	5,445	5,503	5,581	5,606	5,629	5,682	5,679	5,765	5,824	5,906	5,982	6,033	63
gas	1946	3,809	3,814	3,828	3,855	3,857	3,881	3,880	4,005	4,028	4,031	4,029	4,065	4,083	4,084	4,138	4,203	4,209	47
gas	1947	2,657	2,665	2,676	2,713	2,743	2,750	2,767	2,757	2,756	2,776	2,783	2,779	2,793	2,828	2,848	2,847	2,844	50
gas	1948	2,253	2,305	2,385	2,415	2,454	2,475	2,493	2,518	2,518	2,497	2,505	2,473	2,465	2,455	2,443	2,449	2,454	54
gas	1949	5,745	5,764	5,720	5,589	5,560	5,485	5,484	5,498	5,471	5,446	5,443	5,466	5,480	5,495	5,512	5,551	5,581	63
gas	1950	4,397	4,450	4,499	4,566	4,619	4,659	4,719	4,718	4,822	4,868	4,838	4,894	4,920	4,953	4,996	5,042	5,084	68
gas	1951	3,523	3,553	3,569	3,606	3,636	3,679	3,739	3,831	3,868	3,829	3,810	3,834	3,865	3,900	3,970	4,028	4,137	89
gas	1952	6,081	6,105	6,116	6,124	6,129	6,122	6,161	6,260	6,376	6,449	6,438	6,412	6,428	6,522	6,660	6,807	7,130	98
gas	1953	5,232	5,298	5,442	5,536	5,618	5,669	5,730	5,755	5,812	5,873	5,906	5,922	5,994	6,071	6,096	6,071	6,142	113
gas	1954	6,001	6,121	6,158	6,228	6,261	6,292	6,552	6,677	6,806	6,855	7,124	6,928	6,734	7,248	7,302	7,255	7,258	99
gas	1955	4,216	4,279	4,338	4,487	4,615	4,683	4,759	4,946	5,033	5,145	5,248	5,346	5,386	5,446	5,586	5,698	5,868	108
gas	1956	8,724	8,796	8,847	8,921	8,994	9,356	9,379	9,511	9,485	9,496	9,584	9,652	9,794	9,891	9,952	10,085	10,014	121
gas	1957	7,991	7,992	7,980	8,015	8,150	8,233	8,450	8,604	8,675	8,738	8,703	8,709	8,759	8,749	8,794	8,931	9,008	139
gas	1958	6,756	6,837	6,881	6,910	6,889	6,886	6,935	6,979	7,068	7,107	7,218	7,311	7,498	7,610	7,653	7,684	7,818	125
gas	1959	3,036	3,069	3,135	3,194	3,249	3,267	3,319	3,360	3,383	3,409	3,462	3,494	3,503	4,491	3,798	4,122	4,221	129
gas	1960	4,870	4,934	5,060	5,191	5,284	5,467	5,581	5,666	5,769	5,988	6,375	6,892	6,937	6,924	7,131	7,433	8,078	146
gas	1961	3,808	3,852	3,950	4,036	4,069	4,095	4,260	4,386	4,502	4,590	4,618	4,730	4,785	4,812	4,849	4,939	5,010	129
gas	1962	4,975	5,051	5,383	5,532	5,567	5,647	5,853	6,149	6,501	6,574	6,860	7,231	7,747	7,753	7,950	8,110	8,147	113
gas	1963	9,250	9,294	9,311	9,352	9,403	9,433	9,422	9,266	9,469	9,458	9,531	9,625	9,703	9,692	9,886	10,057	10,097	113
gas	1964	3,154	3,191	3,250	3,364	3,519	3,600	3,853	4,312	4,403	4,601	4,813	4,942	5,015	5,267	5,504	5,734	5,848	93
gas	1965	3,092	3,165	3,211	3,218	3,231	3,244	3,306	3,370	3,281	3,333	3,376	3,436	3,501	3,591	3,723	3,775	3,888	99
gas	1966	3,450	3,442	3,466	3,484	3,510	3,507	3,601	3,761	3,851	3,876	3,947	3,999	4,062	4,104	4,123	4,152	4,233	91
gas	1967	2,341	2,380	2,406	2,453	2,481	2,509	2,561	2,582	2,626	2,613	2,661	2,684	2,698	2,722	2,784	2,815	2,978	90
gas	1968	3,628	3,965	4,077	4,244	4,419	4,532	4,682	5,247	5,647	5,679	5,788	5,872	6,113	6,480	6,849	7,224	7,646	78
gas	1969	4,447	4,503	4,506	4,567	4,646	4,728	4,895	4,933	4,968	5,016	5,127	5,178	5,217	5,287	5,359	5,424	5,508	77
gas	1970	1,566	1,568	1,586	1,626	1,779	1,776	1,791	1,825	1,900	1,843	1,824	1,819	1,850	1,890	1,901	1,913	1,964	63
gas	1971	2,584	2,691	2,764	2,779	2,991	3,025	3,226	3,285	3,434	3,482	3,584	3,735	3,869	3,959	3,985	4,139	4,369	84
gas	1972	3,536	3,554	3,604	3,607	3,652	3,625	3,687	3,744	3,802	3,818	3,925	3,924	3,981	3,995	4,031	4,086	4,092	93
gas	1973	3,132	3,126	3,168	3,205	3,257	3,310	3,397	3,436	3,451	3,463	3,516	3,617	3,613	3,617	3,684	3,725	3,770	121
gas	1974	2,853	3,004	3,341	3,581	3,644	3,713	3,687	3,790	3,729	3,802	3,909	4,013	4,125	4,213	4,246	4,307	4,550	130
gas	1975	2,536	2,605	2,657	2,730	2,816	2,875	2,876	2,917	2,993	3,060	3,213	3,315	3,432	3,559	3,742	3,949	4,099	130
gas	1976	1,945	1,991	2,049	2,067	2,075	2,077	2,180	2,335	2,538	2,711	2,744	2,772	2,834	2,984	3,014	3,066	3,137	132
gas	1977	3,120	3,369	3,508	3,554	3,734	3,882	4,234	4,632	4,931	4,937	5,216	5,422	5,510	5,634	5,861	6,110	6,698	144

Table 6. Discovery table showing recoverable gas in gas reservoirs based on the NRG Associates Reservoirs (1982 through 1998) dataset—Continued.

Commodity	Discovery year	Report year																	No. reservoirs
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	
gas	1978	2,068	2,114	2,239	2,297	2,413	2,550	2,620	2,592	2,684	2,742	2,818	2,902	2,962	2,939	3,034	3,245	3,545	136
gas	1979	4,673	5,511	5,813	6,633	6,947	7,109	6,841	7,177	7,165	7,391	7,402	7,702	7,846	8,333	8,521	8,935	9,402	164
gas	1980	1,882	2,185	2,460	2,600	2,806	3,004	3,241	3,626	3,650	4,092	3,996	4,030	4,090	4,181	4,489	4,587	4,803	127
gas	1981	1,145	1,742	2,174	2,254	2,287	2,308	2,339	2,342	2,330	2,429	2,562	2,612	2,664	2,704	2,873	2,977	3,034	139
gas	1982	278	829	1,303	1,668	1,778	1,884	2,027	2,036	2,132	2,138	2,211	2,252	2,311	2,348	2,378	2,555	2,744	116
gas	1983	0	148	533	802	892	1,031	1,077	1,129	1,169	1,143	1,149	1,154	1,158	1,179	1,206	1,255	1,300	69
gas	1984	0	0	376	783	1,126	1,361	1,434	1,483	1,458	1,337	1,356	1,364	1,435	1,506	1,580	1,677	1,760	82
gas	1985	0	0	0	232	563	863	1,766	1,081	1,241	1,252	1,325	1,288	1,375	1,600	1,893	2,155	2,895	90
gas	1986	0	0	0	0	108	283	448	563	634	618	683	604	567	559	549	587	654	44
gas	1987	0	0	0	0	0	130	298	351	395	411	405	381	372	396	472	489	547	44
gas	1988	0	0	0	0	0	0	583	882	947	912	935	877	852	843	985	995	966	49
gas	1989	0	0	0	0	0	0	0	309	710	1,124	1,352	1,475	1,488	1,525	1,589	1,516	1,589	58
gas	1990	0	0	0	0	0	0	0	0	79	573	800	886	1,109	1,283	1,535	1,594	1,622	41
gas	1991	0	0	0	0	0	0	0	0	0	150	312	404	387	409	424	396	431	28
gas	1992	0	0	0	0	0	0	0	0	0	0	117	489	752	810	808	744	687	38
gas	1993	0	0	0	0	0	0	0	0	0	0	0	91	254	422	620	607	614	27
gas	1994	0	0	0	0	0	0	0	0	0	0	0	0	142	382	605	827	1,110	47
gas	1995	0	0	0	0	0	0	0	0	0	0	0	0	0	143	855	1,022	1,035	35
gas	1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	225	593	629	49
gas	1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	176	614	41
gas	1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	394	27
Total gas		282,061	286,911	292,414	297,330	302,078	305,578	310,977	316,218	320,177	324,219	329,069	332,798	337,096	343,203	349,088	354,561	362,308	

Table 7. Growth factors from the Arrington Model—1996 (Arrington, 1960).

Years since discovery	Annual oil factors	Annual gas factors	Cumulative oil factors	Cumulative gas factors	Multipliers, for forecasts			
					30-year oil	30-year gas	80-year oil	80-year gas
0	1.97943	1.78997	1.00000	1.00000	4.81143	5.23719	6.91734	8.38694
1	1.15577	1.24935	1.97943	1.78997	2.46024	2.97223	3.51842	4.72922
2	1.11982	1.07990	2.28777	2.23630	2.14626	2.41473	3.08894	3.94026
3	1.06252	1.08409	2.56190	2.41499	1.94610	2.26926	2.81072	3.87807
4	1.02218	1.07722	2.72207	2.61807	1.85609	2.12181	2.69317	3.63301
5	1.05230	1.05423	2.78244	2.82024	1.84003	1.97556	2.67248	3.56125
6	1.05480	1.06453	2.92794	2.97318	1.77085	1.91602	2.55377	3.04147
7	1.04379	1.02444	3.08840	3.16503	1.69793	1.81873	2.50251	3.23010
8	1.02737	1.03460	3.22365	3.24237	1.63950	1.79341	2.44178	3.16211
9	1.03974	1.02780	3.31189	3.35454	1.59589	1.74937	2.39568	2.92707
10	1.02805	1.04436	3.44349	3.44778	1.55038	1.71144	2.29737	2.90556
11	1.02455	1.02966	3.54009	3.60072	1.51929	1.65029	2.23143	2.78215
12	1.01945	1.02228	3.62699	3.70752	1.49290	1.62114	2.20380	2.80167
13	1.02910	1.03069	3.69754	3.79013	1.47993	1.60284	2.17763	2.91898
14	1.01415	1.02137	3.80514	3.90645	1.44940	1.57360	2.13144	3.23189
15	1.01605	1.03272	3.85899	3.98993	1.44751	1.55123	2.11995	3.47551
16	1.01921	1.01639	3.92091	4.12047	1.43140	1.51791	2.08646	3.36540
17	1.02924	1.01611	3.99623	4.18799	1.42103	1.51501	2.04714	3.31115
18	1.00753	1.02129	4.11307	4.25546	1.39224	1.49937	1.98899	3.25865
19	1.01960	1.01437	4.14402	4.34606	1.38338	1.48155	1.97413	3.19072
20	1.01021	1.01840	4.22523	4.40852	1.36117	1.47481	1.93619	3.14551
21	1.00951	1.01942	4.26837	4.48962	1.35430	1.46781	1.91662	3.08869
22	1.01988	1.01447	4.30896	4.57679	1.34912	1.45194	1.89856	3.02986
23	1.01351	1.02221	4.39464	4.64304	1.32971	1.45365	1.86155	2.98663
24	1.01349	1.01301	4.45399	4.74615	1.31975	1.43278	1.83674	2.92174
25	1.01242	1.01356	4.51409	4.80788	1.31009	1.42530	1.81229	2.88423
26	1.01541	1.01768	4.57013	4.87307	1.29592	1.41783	1.79007	2.84565
27	1.01598	1.01084	4.64057	4.95922	1.27933	1.40622	1.76290	2.79622
28	1.01052	1.02040	4.71473	5.01297	1.26425	1.39348	1.73517	2.76623
29	1.00989	1.02385	4.76432	5.11521	1.25830	1.39014	1.71711	2.71094
30	1.01215	1.01585	4.81143	5.23719	1.25104	1.36251	1.70029	2.64780
31	1.00827	1.01502	4.86988	5.32019	1.23928	1.35101	1.67989	2.60650
32	1.01539	1.01484	4.91015	5.40008	1.23473	1.33854	1.66611	2.56793
33	1.01337	1.01365	4.98572	5.48022	1.22102	1.32331	1.64085	2.53038
34	1.01334	1.00297	5.05239	5.55504	1.21236	1.33528	1.61920	2.49630
35	1.01273	1.02246	5.11978	5.57154	1.19951	1.34107	1.59789	2.48890
36	1.01137	1.01047	5.18495	5.69668	1.19354	1.31137	1.57781	2.43423
37	1.00787	1.01018	5.24388	5.75632	1.19493	1.31237	1.56008	2.40901
38	1.00005	1.00919	5.28516	5.81491	1.19736	1.30216	1.54789	2.38474
39	1.01008	1.00551	5.28543	5.86832	1.20464	1.30308	1.54781	2.36303
40	1.00744	1.00704	5.33872	5.90066	1.19835	1.31058	1.53236	2.35008
41	1.00675	1.01147	5.37844	5.94223	1.19660	1.30719	1.52105	2.33364
42	1.01059	1.01074	5.41475	6.01041	1.19516	1.31114	1.51084	2.30717
43	1.00787	1.01189	5.47209	6.07497	1.18745	1.32126	1.49501	2.28265
44	1.01283	1.00685	5.51516	6.14721	1.18806	1.29722	1.48334	2.25583
45	1.00473	1.01054	5.58593	6.18929	1.18197	1.29825	1.46454	2.24049
46	1.01183	1.01445	5.61238	6.25451	1.18409	1.30162	1.45764	2.21713
47	1.00839	1.00562	5.67877	6.34486	1.17955	1.29590	1.44060	2.18556
48	1.00111	1.00915	5.72640	6.38050	1.18661	1.30216	1.42862	2.17335
49	1.00323	1.00976	5.73277	6.43888	1.19290	1.28646	1.42703	2.15364
50	1.00511	1.01356	5.75127	6.50172	1.20275	1.28996	1.42244	2.13283
51	1.00565	1.00839	5.78065	6.58990	1.20479	1.28456	1.41521	2.10429
52	1.00520	1.01567	5.81333	6.64521	1.21562	1.32601	1.40726	2.08677
53	1.00592	1.00753	5.84359	6.74936	1.23226	1.38761	1.39997	2.05457
54	1.00607	1.00771	5.87818	6.80021	1.24715	1.39870	1.39173	2.03921

Table 7. Growth factors from the Arrington Model—1996 (Arrington, 1960)—Continued.

Years since discovery	Annual oil factors	Annual gas factors	Cumulative oil factors	Cumulative gas factors	Multipliers, for forecasts			
					30-year oil	30-year gas	80-year oil	80-year gas
55	1.00147	1.00825	5.91384	6.85267	1.25739	1.46564	1.38334	2.02360
56	1.00241	1.00934	5.92255	6.90919	1.26251	1.30881	1.38131	2.00704
57	1.00401	1.00168	5.93680	6.97374	1.30184	1.46598	1.37799	1.98847
58	1.00576	1.01795	5.96061	6.98546	1.32058	1.46773	1.37249	1.98513
59	1.00406	1.00349	5.99495	7.11086	1.32349	1.38084	1.36462	1.95012
60	1.00263	1.00727	6.01930	7.13570	1.31427	1.40389	1.35910	1.94333
61	1.00456	1.00565	6.03516	7.18760	1.30891	1.39375	1.35553	1.92930
62	1.00412	1.00330	6.06270	7.22819	1.31842	1.43704	1.34937	1.91846
63	1.00619	1.02282	6.08766	7.25203	1.32265	1.52555	1.34384	1.91216
64	1.00260	1.00732	6.12533	7.41753	1.32408	1.70208	1.33558	1.86950
65	1.00768	0.99982	6.14124	7.47180	1.33212	1.85592	1.33212	1.85592
66	1.01255	1.01123	6.18843	7.47048	1.32196	1.85624	1.32196	1.85624
67	1.00992	1.00232	6.26607	7.55440	1.30558	1.83562	1.30558	1.83562
68	1.00613	1.00990	6.32823	7.57195	1.29275	1.83137	1.29275	1.83137
69	1.00481	1.01130	6.36705	7.64688	1.28487	1.81342	1.28487	1.81342
70	1.00597	1.00443	6.39767	7.73331	1.27872	1.79316	1.27872	1.79316
71	1.00554	1.01453	6.43586	7.76760	1.27114	1.78524	1.27114	1.78524
72	1.00407	1.01854	6.47149	7.88047	1.26414	1.75967	1.26414	1.75967
73	1.00839	0.99348	6.49781	8.02661	1.25902	1.72763	1.25902	1.72763
74	1.00764	1.00765	6.55234	7.97430	1.24854	1.73897	1.24854	1.73897
75	1.00654	1.01316	6.60238	8.03527	1.23908	1.72577	1.23908	1.72577
76	1.00795	1.00999	6.64558	8.14099	1.23102	1.70336	1.23102	1.70336
77	1.01442	1.01047	6.69839	8.22230	1.22132	1.68652	1.22132	1.68652
78	1.00642	0.99699	6.79500	8.30841	1.20395	1.66904	1.20395	1.66904
79	1.01151	1.01250	6.83861	8.28338	1.19627	1.67408	1.19627	1.67408
80	1.00682	1.00932	6.91734	8.38694	1.18266	1.65341	1.18266	1.65341
81	1.01469	1.04093	6.96449	8.46514	1.17465	1.63813	1.17465	1.63813
82	1.01896	1.06286	7.06679	8.81162	1.15765	1.57372	1.15765	1.57372
83	1.01808	1.01559	7.20079	9.36548	1.13610	1.48065	1.13610	1.48065
84	1.01433	1.05594	7.33098	9.51145	1.11593	1.45793	1.11593	1.45793
85	1.00555	0.90036	7.43600	10.04356	1.10017	1.38069	1.10017	1.38069
86	1.03363	1.13055	7.47729	9.04283	1.09409	1.53348	1.09409	1.53348
87	1.01846	1.00287	7.72875	10.22336	1.05850	1.35641	1.05850	1.35641
88	1.00798	0.95769	7.87144	10.25274	1.03931	1.35252	1.03931	1.35252
89	0.99707	1.02024	7.93425	9.81897	1.03108	1.41227	1.03108	1.41227
90	0.99855	1.00000	7.91097	10.01773	1.03411	1.38425	1.03411	1.38425
91	1.01186	1.03689	7.89948	10.01773	1.03562	1.38425	1.03562	1.38425
92	1.00734	1.06509	7.99318	10.38724	1.02348	1.33501	1.02348	1.33501
93	1.00727	1.14118	8.05187	11.06333	1.01602	1.25342	1.01602	1.25342
94	1.00868	1.09836	8.11042	12.62521	1.00868	1.09836	1.00868	1.09836
95	0.98952	1.05051	8.18085	13.86704	1.00000	1.00000	1.00000	1.00000
96	1.00000	1.00000	8.18085	13.86704	1.00000	1.00000	1.00000	1.00000
97	1.00000	1.00000	8.18085	13.86704	1.00000	1.00000	1.00000	1.00000
98	1.00000	1.00000	8.18085	13.86704	1.00000	1.00000	1.00000	1.00000
99	1.00000	1.00000	8.18085	13.86704	1.00000	1.00000	1.00000	1.00000
100	1.00000	1.00000	8.18085	13.86704	1.00000	1.00000	1.00000	1.00000

Table 8. Growth factors from the Mean of U.S. Lower 48 Annual Growth Factors—1996 model.

Years since discovery	Annual oil factors	Annual gas factors	Cumulative oil factors	Cumulative gas factors	Multipliers, for forecasts			
					30-year oil	30-year gas	80-year oil	80-year gas
0	2.00003	1.85752	1.00000	1.00000	4.86792	5.35267	7.07487	20.04353
1	1.16938	1.21431	2.00003	1.85752	2.46683	2.93657	3.56203	11.27496
2	1.11420	1.08080	2.33880	2.25561	2.12890	2.45298	3.08729	9.33281
3	1.04605	1.06812	2.60588	2.43786	1.93702	2.31354	2.80441	9.39381
4	1.02333	1.08568	2.72589	2.60394	1.87148	2.20255	2.71196	9.78555
5	1.05029	1.05208	2.78947	2.82704	1.85270	2.03949	2.67935	10.83116
6	1.05372	1.06774	2.92975	2.97428	1.78554	1.97726	2.56035	12.47188
7	1.04254	1.01472	3.08715	3.17577	1.71365	1.87461	2.46880	12.52569
8	1.03074	1.04187	3.21847	3.22253	1.65700	1.87244	2.38841	14.60375
9	1.03545	1.03103	3.31741	3.35746	1.61237	1.81074	2.33151	15.88762
10	1.02741	1.05154	3.43502	3.46164	1.57227	1.76444	2.25016	15.21895
11	1.02730	1.03539	3.52918	3.64005	1.54083	1.68907	2.18403	15.50666
12	1.01787	1.02532	3.62552	3.76887	1.50960	1.65142	2.13635	15.92179
13	1.02758	1.03017	3.69030	3.86431	1.49637	1.62827	2.10564	16.86093
14	1.01610	1.02162	3.79206	3.98092	1.46593	1.60154	2.05778	18.05605
15	1.01615	1.03306	3.85311	4.06696	1.45827	1.57865	2.05863	19.37719
16	1.02081	1.01586	3.91536	4.20140	1.44155	1.54452	2.03085	19.19005
17	1.02835	1.01417	3.99685	4.26803	1.42480	1.54122	2.00565	19.30618
18	1.01073	1.02145	4.11016	4.32852	1.39566	1.53287	1.95036	19.03636
19	1.02319	1.01511	4.15426	4.42138	1.38490	1.51704	1.92966	18.63655
20	1.01788	1.01976	4.25059	4.48820	1.35796	1.51146	1.88592	18.35912
21	1.00865	1.01961	4.32657	4.57688	1.33962	1.50300	1.85280	18.00339
22	1.01698	1.01391	4.36402	4.66665	1.33568	1.48638	1.83691	17.65709
23	1.01451	1.02110	4.43812	4.73155	1.31931	1.48331	1.80624	17.41486
24	1.01363	1.01571	4.50252	4.83139	1.30736	1.46501	1.78040	17.05499
25	1.01292	1.01162	4.56390	4.90728	1.29768	1.46305	1.75646	16.79125
26	1.01537	1.01778	4.62288	4.96432	1.28490	1.45485	1.73405	16.59832
27	1.01621	1.01146	4.69395	5.05260	1.27166	1.44765	1.70779	16.30831
28	1.01038	1.02287	4.77006	5.11052	1.25608	1.43339	1.68054	16.12349
29	1.01003	1.02396	4.81959	5.22740	1.25073	1.41700	1.66327	15.76298
30	1.01352	1.01907	4.86792	5.35267	1.24468	1.40147	1.64676	15.39407
31	1.00919	1.01435	4.93375	5.45472	1.23227	1.38215	1.62479	15.10606
32	1.01377	1.01936	4.97908	5.53297	1.22765	1.37500	1.61000	14.89242
33	1.01066	1.01688	5.04764	5.64008	1.21601	1.37568	1.58813	14.60961
34	1.01306	1.00530	5.10144	5.73531	1.21286	1.37335	1.57138	14.36703
35	1.01222	1.01998	5.16806	5.76573	1.20240	1.38924	1.55112	14.29124
36	1.01130	1.01231	5.23119	5.88093	1.20035	1.36219	1.53240	14.01127
37	1.00807	1.01355	5.29031	5.95334	1.20540	1.37180	1.51528	13.84087
38	1.00298	1.00754	5.33300	6.03399	1.20722	1.38116	1.50315	13.65586
39	1.00970	1.00467	5.34889	6.07948	1.21416	1.38562	1.49868	13.55368
40	1.00686	1.00662	5.40080	6.10787	1.20818	1.41572	1.48428	13.49069
41	1.00648	1.01231	5.43786	6.14830	1.20901	1.48827	1.47416	13.40198
42	1.00895	1.01095	5.47308	6.22398	1.21135	1.50211	1.46468	13.23901
43	1.00667	1.01326	5.52206	6.29216	1.21056	1.73895	1.45168	13.09556
44	1.01079	1.00701	5.55888	6.37561	1.21584	1.73464	1.44207	12.92416
45	1.00450	1.01072	5.61888	6.42033	1.21047	1.76857	1.42667	12.83413
46	1.00895	1.01369	5.64418	6.48916	1.21264	2.14969	1.42028	12.69801
47	1.00732	1.00868	5.69471	6.57798	1.20741	2.79790	1.40767	12.52654
48	1.00294	1.01090	5.73639	6.63507	1.21789	2.72866	1.39745	12.41877
49	1.00329	1.01138	5.75323	6.70741	1.21632	2.93771	1.39335	12.28483
50	1.00413	1.01405	5.77215	6.78371	1.22569	2.95465	1.38879	12.14665
51	1.00569	1.00833	5.79596	6.87905	1.22916	3.04452	1.38308	11.97830
52	1.00452	1.01182	5.82892	6.93639	1.23875	3.03489	1.37526	11.87929
53	1.00532	1.00850	5.85524	7.01837	1.24811	3.26298	1.36908	11.74052
54	1.00613	1.01435	5.88640	7.07803	1.25586	3.60000	1.36183	11.64157

Table 8. Growth factors from the Mean of U.S. Lower 48 Annual Growth Factors —1996 model—Continued.

Years since discovery	Annual oil factors	Annual gas factors	Cumulative oil factors	Cumulative gas factors	Multipliers, for forecasts			
					30-year oil	30-year gas	80-year oil	80-year gas
55	1.00295	1.00595	5.92247	7.17959	1.26197	4.26489	1.35354	11.47689
56	1.00491	1.01275	5.93995	7.22232	1.26284	5.13615	1.34956	11.40899
57	1.00376	1.00150	5.96912	7.31438	1.27683	5.43842	1.34296	11.26540
58	1.00608	1.01117	5.99158	7.32536	1.28297	6.42439	1.33793	11.24850
59	1.00515	1.01274	6.02799	7.40722	1.28311	7.20137	1.32984	11.12419
60	1.00342	1.00502	6.05901	7.50160	1.27568	7.02285	1.32304	10.98424
61	1.00541	1.00910	6.07970	7.53926	1.26780	7.48681	1.31853	10.92937
62	1.00416	1.01986	6.11257	7.60785	1.26712	7.88754	1.31145	10.83083
63	1.00804	1.01516	6.13797	7.75894	1.26596	8.39752	1.30602	10.61992
64	1.00433	1.01693	6.18731	7.87659	1.26117	9.12573	1.29560	10.46130
65	1.01049	1.00012	6.21408	8.00997	1.27648	9.83853	1.29002	10.28710
66	1.01555	1.01945	6.27928	8.01094	1.26631	10.06438	1.27663	10.28586
67	1.00960	1.02046	6.37694	8.16677	1.25708	10.08959	1.25708	10.08959
68	1.00874	1.01079	6.43813	8.33389	1.24513	9.88726	1.24513	9.88726
69	1.00473	1.02649	6.49440	8.42385	1.23434	9.78167	1.23434	9.78167
70	1.00755	1.05821	6.52512	8.64701	1.22853	9.52923	1.22853	9.52923
71	1.00843	1.02172	6.57441	9.15036	1.21932	9.00504	1.21932	9.00504
72	1.00829	1.17035	6.62982	9.34911	1.20913	8.81361	1.20913	8.81361
73	1.01106	1.01075	6.68477	10.94173	1.19919	7.53075	1.19919	7.53075
74	1.00633	1.02671	6.75869	11.05940	1.18607	7.45062	1.18607	7.45062
75	1.00631	1.22853	6.80146	11.35479	1.17861	7.25679	1.17861	7.25679
76	1.00460	1.31935	6.84437	13.94968	1.17122	5.90690	1.17122	5.90690
77	1.01606	0.98372	6.87585	18.40455	1.16586	4.47712	1.16586	4.47712
78	1.00164	1.08835	6.98631	18.10484	1.14743	4.55123	1.14743	4.55123
79	1.01102	1.01721	6.99777	19.70442	1.14555	4.18177	1.14555	4.18177
80	1.00697	1.04490	7.07487	20.04353	1.13307	4.11102	1.13307	4.11102
81	1.01353	1.00514	7.12417	20.94344	1.12522	3.93438	1.12522	3.93438
82	1.01211	1.08786	7.22056	21.05116	1.11020	3.91424	1.11020	3.91424
83	1.01157	1.11267	7.30797	22.90079	1.09692	3.59810	1.09692	3.59810
84	1.01102	1.20169	7.39251	25.48093	1.08438	3.23377	1.08438	3.23377
85	1.00364	1.21146	7.47395	30.62012	1.07256	2.69102	1.07256	2.69102
86	1.01605	1.07235	7.50119	37.09490	1.06867	2.22131	1.06867	2.22131
87	1.00859	1.18307	7.62158	39.77867	1.05179	2.07145	1.05179	2.07145
88	1.00619	1.13347	7.68703	47.06097	1.04283	1.75091	1.04283	1.75091
89	0.99932	0.98764	7.73459	53.34212	1.03642	1.54473	1.03642	1.54473
90	0.99721	1.07142	7.72935	52.68256	1.03712	1.56407	1.03712	1.56407
91	1.00487	1.06311	7.70783	56.44500	1.04002	1.45982	1.04002	1.45982
92	1.00324	1.08580	7.74538	60.00722	1.03498	1.37316	1.03498	1.37316
93	1.00422	1.10319	7.77045	65.15588	1.03164	1.26465	1.03164	1.26465
94	1.01652	1.09637	7.80321	71.87960	1.02731	1.14635	1.02731	1.14635
95	1.00244	1.02308	7.93213	78.80634	1.01061	1.04559	1.01061	1.04559
96	1.00815	1.02201	7.95151	80.62515	1.00815	1.02201	1.00815	1.02201
97	1.00458	1.04212	8.01629	82.39936	1.00000	1.00000	1.00000	1.00000
98	1.00000	1.00000	8.01629	82.39936	1.00000	1.00000	1.00000	1.00000
99	1.00000	1.00000	8.01629	82.39936	1.00000	1.00000	1.00000	1.00000
100	1.00000	1.00000	8.01629	82.39936	1.00000	1.00000	1.00000	1.00000

Table 9. Growth factors from the MMS Federal Offshore—1996 model (Lore and others, 1996).

Years since discovery	Annual oil and gas factors	Cumulative oil and gas factors	Multipliers, for forecasts	
			30-year oil and gas	80-year oil and gas
0	1.20831	1.00000	4.07310	4.41061
1	1.16069	1.20831	3.40140	3.65023
2	1.12977	1.40247	2.95492	3.14489
3	1.10808	1.58447	2.63556	2.78365
4	1.09203	1.75572	2.39522	2.51214
5	1.07967	1.91730	2.20748	2.30043
6	1.06985	2.07005	2.05659	2.13068
7	1.06187	2.21464	1.93256	1.99157
8	1.05526	2.35166	1.82873	1.87553
9	1.04968	2.48161	1.74047	1.77732
10	1.04492	2.60490	1.66450	1.69320
11	1.04081	2.72191	1.59839	1.62041
12	1.03722	2.83299	1.54032	1.55687
13	1.03406	2.93844	1.48889	1.50100
14	1.03126	3.03852	1.44302	1.45157
15	1.02876	3.13351	1.40184	1.40756
16	1.02651	3.22362	1.36466	1.36822
17	1.02448	3.30907	1.33092	1.33289
18	1.02263	3.39007	1.30017	1.30104
19	1.02095	3.46680	1.27201	1.27224
20	1.01941	3.53944	1.24613	1.24613
21	1.01800	3.60815	1.22240	1.22240
22	1.01669	3.67310	1.20079	1.20079
23	1.01549	3.73442	1.18107	1.18107
24	1.01437	3.79225	1.16306	1.16306
25	1.01333	3.84673	1.14659	1.14659
26	1.01235	3.89799	1.13151	1.13151
27	1.01145	3.94614	1.11770	1.11770
28	1.01059	3.99131	1.10505	1.10505
29	1.00980	4.03359	1.09347	1.09347
30	1.00904	4.07310	1.08286	1.08286
31	1.00833	4.10994	1.07316	1.07316
32	1.00767	4.14419	1.06429	1.06429
33	1.00703	4.17597	1.05619	1.05619
34	1.00644	4.20534	1.04881	1.04881
35	1.00587	4.23241	1.04210	1.04210
36	1.00533	4.25724	1.03603	1.03603
37	1.00482	4.27993	1.03053	1.03053
38	1.00433	4.30055	1.02559	1.02559
39	1.00386	4.31916	1.02117	1.02117
40	1.00342	4.33585	1.01724	1.01724
41	1.00299	4.35068	1.01377	1.01377
42	1.00259	4.36371	1.01075	1.01075
43	1.00220	4.37501	1.00814	1.00814
44	1.00183	4.38465	1.00592	1.00592
45	1.00147	4.39267	1.00408	1.00408
46	1.00113	4.39914	1.00261	1.00261
47	1.00080	4.40412	1.00147	1.00147
48	1.00049	4.40766	1.00067	1.00067
49	1.00018	4.40980	1.00018	1.00018
50	1.00000	4.41061	1.00000	1.00000
51	1.00000	4.41061	1.00000	1.00000
52	1.00000	4.41061	1.00000	1.00000
53	1.00000	4.41061	1.00000	1.00000
54	1.00000	4.41061	1.00000	1.00000

Table 9. Growth factors from the MMS Federal Offshore—1996 model (Lore and others, 1996)—
Continued.

Years since discovery	Annual oil and gas factors	Cumulative oil and gas factors	Multipliers, for forecasts	
			30-year oil and gas	80-year oil and gas
55	1.00000	4.41061	1.00000	1.00000
56	1.00000	4.41061	1.00000	1.00000
57	1.00000	4.41061	1.00000	1.00000
58	1.00000	4.41061	1.00000	1.00000
59	1.00000	4.41061	1.00000	1.00000
60	1.00000	4.41061	1.00000	1.00000
61	1.00000	4.41061	1.00000	1.00000
62	1.00000	4.41061	1.00000	1.00000
63	1.00000	4.41061	1.00000	1.00000
64	1.00000	4.41061	1.00000	1.00000
65	1.00000	4.41061	1.00000	1.00000
66	1.00000	4.41061	1.00000	1.00000
67	1.00000	4.41061	1.00000	1.00000
68	1.00000	4.41061	1.00000	1.00000
69	1.00000	4.41061	1.00000	1.00000
70	1.00000	4.41061	1.00000	1.00000
71	1.00000	4.41061	1.00000	1.00000
72	1.00000	4.41061	1.00000	1.00000
73	1.00000	4.41061	1.00000	1.00000
74	1.00000	4.41061	1.00000	1.00000
75	1.00000	4.41061	1.00000	1.00000
76	1.00000	4.41061	1.00000	1.00000
77	1.00000	4.41061	1.00000	1.00000
78	1.00000	4.41061	1.00000	1.00000
79	1.00000	4.41061	1.00000	1.00000
80	1.00000	4.41061	1.00000	1.00000
81	1.00000	4.41061	1.00000	1.00000
82	1.00000	4.41061	1.00000	1.00000
83	1.00000	4.41061	1.00000	1.00000
84	1.00000	4.41061	1.00000	1.00000
85	1.00000	4.41061	1.00000	1.00000
86	1.00000	4.41061	1.00000	1.00000
87	1.00000	4.41061	1.00000	1.00000
88	1.00000	4.41061	1.00000	1.00000
89	1.00000	4.41061	1.00000	1.00000
90	1.00000	4.41061	1.00000	1.00000
91	1.00000	4.41061	1.00000	1.00000
92	1.00000	4.41061	1.00000	1.00000
93	1.00000	4.41061	1.00000	1.00000
94	1.00000	4.41061	1.00000	1.00000
95	1.00000	4.41061	1.00000	1.00000
96	1.00000	4.41061	1.00000	1.00000
97	1.00000	4.41061	1.00000	1.00000
98	1.00000	4.41061	1.00000	1.00000
99	1.00000	4.41061	1.00000	1.00000
100	1.00000	4.41061	1.00000	1.00000

Table 10. Growth factors from the NRG U.S. Lower 48 Fields Monotone—1998 model (E.D. Attanasi, written commun., 2001).

Years since discovery	Annual oil factors	Annual gas factors	Cumulative oil factors	Cumulative gas factors	Multipliers, for forecasts			
					30-year oil	30-year gas	80-year oil	80-year gas
0	2.62760	1.89830	1.00000	1.00000	7.72740	7.57200	11.18960	11.73370
1	1.40569	1.37302	2.62760	1.89830	2.97096	4.07054	4.28292	6.19781
2	1.14268	1.15205	3.69360	2.60640	2.13518	3.02536	3.06433	4.52620
3	1.09937	1.09725	4.22060	3.00270	1.88774	2.67985	2.69708	3.93942
4	1.03315	1.07907	4.64000	3.29470	1.73470	2.47564	2.46737	3.59996
5	1.03315	1.07910	4.79380	3.55520	1.69625	2.32015	2.40194	3.34521
6	1.03317	1.06342	4.95270	3.83640	1.65865	2.17436	2.33820	3.10838
7	1.03314	1.04696	5.11700	4.07970	1.62185	2.06777	2.27612	2.93088
8	1.03316	1.04696	5.28660	4.27130	1.58590	1.99733	2.21573	2.80697
9	1.03316	1.04696	5.46190	4.47190	1.54942	1.92929	2.15694	2.68830
10	1.03316	1.03291	5.64300	4.68190	1.51276	1.86356	2.09970	2.57464
11	1.03316	1.03292	5.83010	4.83600	1.47697	1.82455	2.04398	2.49932
12	1.02789	1.03069	6.02340	4.99520	1.44203	1.78259	1.98974	2.42621
13	1.02684	1.03071	6.19140	5.14850	1.41511	1.74536	1.94685	2.36032
14	1.01996	1.03070	6.35760	5.30660	1.39012	1.70887	1.90684	2.29618
15	1.01423	1.02618	6.48450	5.46950	1.37479	1.67317	1.88025	2.23381
16	1.01425	1.02580	6.57680	5.61270	1.36731	1.64543	1.86451	2.18268
17	1.01424	1.02581	6.67050	5.75750	1.35984	1.61874	1.84886	2.12778
18	1.01425	1.02579	6.76550	5.90610	1.35242	1.59247	1.82290	2.07425
19	1.01092	1.02048	6.86190	6.05840	1.34504	1.56665	1.79729	2.02210
20	1.01091	1.02048	6.93680	6.18250	1.34210	1.54928	1.77788	1.98151
21	1.01092	1.02048	7.01250	6.30910	1.33918	1.53210	1.75869	1.94175
22	1.01092	1.02049	7.08910	6.43830	1.33623	1.51512	1.73968	1.90278
23	1.01091	1.02047	7.16650	6.57020	1.33331	1.49830	1.72090	1.86459
24	1.01092	1.02048	7.24470	6.70470	1.33042	1.48169	1.70232	1.82718
25	1.01092	1.02049	7.32380	6.84200	1.32418	1.46527	1.68393	1.79051
26	1.01091	1.02048	7.40380	6.98220	1.31738	1.44900	1.66574	1.75456
27	1.01093	1.02048	7.48460	7.12520	1.31064	1.43293	1.64776	1.71935
28	1.01092	1.02048	7.56640	7.27110	1.30391	1.41705	1.62994	1.68485
29	1.01025	1.02049	7.64900	7.42000	1.29723	1.40133	1.61234	1.65104
30	1.01024	1.02048	7.72740	7.57200	1.29143	1.38579	1.59598	1.61789
31	1.01025	1.02047	7.80650	7.72710	1.28569	1.37041	1.57981	1.58542
32	1.01026	1.02048	7.88650	7.88530	1.27995	1.35522	1.56379	1.55361
33	1.01024	1.01363	7.96740	8.04680	1.27423	1.34018	1.54791	1.52243
34	1.01025	1.01129	8.04900	8.15650	1.26854	1.33429	1.53222	1.50196
35	1.01024	1.01129	8.13150	8.24860	1.26288	1.32877	1.51667	1.48519
36	1.01025	1.01129	8.21480	8.34170	1.25726	1.32329	1.50129	1.46861
37	1.01024	1.01130	8.29900	8.43590	1.25163	1.31782	1.48606	1.45221
38	1.00940	1.01130	8.38400	8.53120	1.24605	1.30910	1.47099	1.43599
39	1.00871	1.01129	8.46280	8.62760	1.24154	1.30042	1.45730	1.41994
40	1.00872	1.01129	8.53650	8.72500	1.23788	1.29183	1.44471	1.40409
41	1.00871	1.00917	8.61090	8.82350	1.23423	1.28328	1.43223	1.38842
42	1.00870	1.00916	8.68590	8.90440	1.23059	1.27747	1.41986	1.37580
43	1.00871	1.00916	8.76150	8.98600	1.22698	1.27169	1.40761	1.36331
44	1.00871	1.00916	8.83780	9.06830	1.22337	1.26595	1.39546	1.35094
45	1.00872	1.00917	8.91480	9.15140	1.21976	1.26022	1.38341	1.33867
46	1.00871	1.00916	8.99250	9.23530	1.21616	1.25452	1.37145	1.32651
47	1.00871	1.00916	9.07080	9.31990	1.21258	1.24885	1.35962	1.31447
48	1.00871	1.00915	9.14980	9.40530	1.20901	1.24085	1.34788	1.30253
49	1.00871	1.00917	9.22950	9.49140	1.20545	1.23292	1.33624	1.29072
50	1.00871	1.00917	9.30990	9.57840	1.20190	1.22502	1.32470	1.27899
51	1.00870	1.00917	9.39100	9.66620	1.19836	1.21716	1.31326	1.26737
52	1.00871	1.00915	9.47270	9.75480	1.19484	1.20936	1.30193	1.25586
53	1.00872	1.00916	9.55520	9.84410	1.19132	1.20162	1.29069	1.24447
54	1.00617	1.00917	9.63850	9.93430	1.18780	1.19392	1.27954	1.23317
55	1.00573	1.00916	9.69800	10.02540	1.18730	1.18628	1.27168	1.22197

Table 10. Growth factors from the NRG U.S. Lower 48 Fields Monotone —1998 model (E.D. Attanasi, written commun., 2001)—Continued.

Years since discovery	Annual oil factors	Annual gas factors	Cumulative oil factors	Cumulative gas factors	Multipliers, for forecasts			
					30-year oil	30-year gas	80-year oil	80-year gas
56	1.00574	1.00916	9.75360	10.11720	1.18729	1.17869	1.26444	1.21088
57	1.00574	1.00917	9.80960	10.20990	1.18730	1.17113	1.25722	1.19988
58	1.00574	1.00916	9.86590	10.30350	1.18729	1.16362	1.25004	1.18898
59	1.00573	1.00917	9.92250	10.39790	1.18730	1.15618	1.24291	1.17819
60	1.00574	1.00916	9.97940	10.49320	1.18731	1.14876	1.23583	1.16749
61	1.00574	1.00916	10.03670	10.58930	1.18730	1.14141	1.22877	1.15689
62	1.00575	1.00916	10.09430	10.68630	1.18730	1.13411	1.22176	1.14639
63	1.00573	1.00917	10.15230	10.78420	1.18729	1.12684	1.21478	1.13599
64	1.00574	1.00711	10.21050	10.88310	1.18730	1.11962	1.20785	1.12566
65	1.00575	1.00712	10.26910	10.96050	1.18730	1.11471	1.20096	1.11771
66	1.00573	1.00711	10.32810	11.03850	1.18729	1.10982	1.19410	1.10982
67	1.00574	1.00461	10.38730	11.11700	1.18730	1.10198	1.18730	1.10198
68	1.00574	1.00459	10.44690	11.16820	1.18052	1.09693	1.18052	1.09693
69	1.00574	1.00461	10.50690	11.21950	1.17378	1.09191	1.17378	1.09191
70	1.00573	1.00460	10.56720	11.27120	1.16708	1.08690	1.16708	1.08690
71	1.00574	1.00460	10.62780	11.32300	1.16043	1.08193	1.16043	1.08193
72	1.00574	1.00460	10.68880	11.37510	1.15381	1.07698	1.15381	1.07698
73	1.00574	1.00460	10.75020	11.42740	1.14722	1.07205	1.14722	1.07205
74	1.00573	1.00460	10.81190	11.48000	1.14067	1.06713	1.14067	1.06713
75	1.00574	1.00460	10.87390	11.53280	1.13417	1.06225	1.13417	1.06225
76	1.00574	1.00460	10.93630	11.58590	1.12769	1.05738	1.12769	1.05738
77	1.00574	1.00270	10.99910	11.63920	1.12126	1.05254	1.12126	1.05254
78	1.00574	1.00270	11.06220	11.67060	1.11486	1.04971	1.11486	1.04971
79	1.00574	1.00270	11.12570	11.70210	1.10850	1.04688	1.10850	1.04688
80	1.00574	1.00269	11.18960	11.73370	1.10217	1.04406	1.10217	1.04406
81	1.00574	1.00270	11.25380	11.76530	1.09588	1.04126	1.09588	1.04126
82	1.00573	1.00270	11.31840	11.79710	1.08962	1.03845	1.08962	1.03845
83	1.00574	1.00270	11.38330	11.82890	1.08341	1.03566	1.08341	1.03566
84	1.00575	1.00271	11.44860	11.86080	1.07723	1.03287	1.07723	1.03287
85	1.00573	1.00270	11.51440	11.89290	1.07108	1.03009	1.07108	1.03009
86	1.00574	1.00269	11.58040	11.92500	1.06497	1.02731	1.06497	1.02731
87	1.00574	1.00270	11.64690	11.95710	1.05889	1.02455	1.05889	1.02455
88	1.00575	1.00270	11.71370	11.98940	1.05285	1.02179	1.05285	1.02179
89	1.00574	1.00270	11.78100	12.02180	1.04684	1.01904	1.04684	1.01904
90	1.00574	1.00270	11.84860	12.05420	1.04087	1.01630	1.04087	1.01630
91	1.00574	1.00271	11.91660	12.08670	1.03493	1.01357	1.03493	1.01357
92	1.00573	1.00270	11.98500	12.11940	1.02902	1.01083	1.02902	1.01083
93	1.00574	1.00270	12.05370	12.15210	1.02315	1.00811	1.02315	1.00811
94	1.00574	1.00270	12.12290	12.18490	1.01731	1.00540	1.01731	1.00540
95	1.00574	1.00269	12.19250	12.21780	1.01151	1.00269	1.01151	1.00269
96	1.00573	1.00000	12.26250	12.25070	1.00573	1.00000	1.00573	1.00000
97	1.00000	1.00000	12.33280	12.25070	1.00000	1.00000	1.00000	1.00000
98	1.00000	1.00000	12.33280	12.25070	1.00000	1.00000	1.00000	1.00000
99	1.00000	1.00000	12.33280	12.25070	1.00000	1.00000	1.00000	1.00000
100	1.00000	1.00000	12.33280	12.25070	1.00000	1.00000	1.00000	1.00000

Table 11. Growth factors from the NRG U.S. Lower 48 Reservoirs Monotone—1998 model (E.D. Attanasi, written commun., 2001).

Years since discovery	Annual oil factors	Annual gas factors	Cumulative oil factors	Cumulative gas factors	Multipliers, for forecasts			
					30-year oil	30-year gas	80-year oil	80-year gas
0	2.44190	2.10820	1.00000	1.00000	6.21380	7.41890	8.87940	9.97810
1	1.29186	1.35224	2.44190	2.10820	2.56808	3.57926	3.65682	4.73299
2	1.14839	1.15648	3.15460	2.85080	2.00618	2.69223	2.84670	3.50011
3	1.08314	1.10677	3.62270	3.29690	1.76305	2.36780	2.49289	3.02651
4	1.02969	1.06243	3.92390	3.64890	1.64268	2.16553	2.31456	2.73455
5	1.02970	1.06242	4.04040	3.87670	1.61001	2.06320	2.26054	2.57386
6	1.02706	1.04421	4.16040	4.11870	1.57716	1.96569	2.20777	2.42263
7	1.02705	1.03348	4.27300	4.30080	1.54894	1.89386	2.16176	2.32006
8	1.02705	1.03348	4.38860	4.44480	1.52124	1.84362	2.11673	2.24489
9	1.02707	1.03348	4.50730	4.59360	1.49404	1.79469	2.07266	2.17217
10	1.02707	1.03065	4.62930	4.74740	1.46731	1.74706	2.02946	2.10180
11	1.02705	1.02865	4.75460	4.89290	1.44107	1.70537	1.98717	2.03930
12	1.02705	1.02865	4.88320	5.03310	1.41530	1.66790	1.94577	1.98250
13	1.02706	1.02864	5.01530	5.17730	1.39001	1.63126	1.90525	1.92728
14	1.02190	1.02864	5.15100	5.32560	1.36515	1.59543	1.86556	1.87361
15	1.01197	1.02864	5.26380	5.47810	1.34751	1.56041	1.83592	1.82145
16	1.01198	1.02866	5.32680	5.63500	1.34313	1.52614	1.82447	1.77074
17	1.01197	1.02864	5.39060	5.79650	1.33877	1.49055	1.81308	1.72140
18	1.01195	1.02865	5.45510	5.96250	1.33444	1.45585	1.79164	1.67348
19	1.01098	1.01758	5.52030	6.13330	1.33013	1.42193	1.77048	1.62687
20	1.01098	1.01758	5.58090	6.24110	1.32712	1.40390	1.75126	1.59877
21	1.01097	1.01757	5.64220	6.35080	1.32411	1.38611	1.73223	1.57116
22	1.01099	1.01756	5.70410	6.46240	1.32112	1.36855	1.71343	1.54402
23	1.01098	1.01758	5.76680	6.57590	1.31811	1.35121	1.69480	1.51737
24	1.01098	1.01757	5.83010	6.69150	1.31514	1.33408	1.67640	1.49116
25	1.01098	1.01758	5.89410	6.80910	1.30822	1.31718	1.65820	1.46541
26	1.01098	1.01758	5.95880	6.92880	1.30134	1.30048	1.64020	1.44009
27	1.01097	1.01710	6.02420	7.05060	1.29450	1.28399	1.62239	1.41521
28	1.01098	1.01712	6.09030	7.17120	1.28770	1.26831	1.60478	1.39141
29	1.00919	1.01712	6.15720	7.29400	1.28091	1.25278	1.58734	1.36799
30	1.00921	1.01710	6.21380	7.41890	1.27643	1.23746	1.57289	1.34496
31	1.00920	1.01712	6.27100	7.54580	1.27195	1.22234	1.55854	1.32234
32	1.00921	1.01712	6.32870	7.67500	1.26748	1.20739	1.54433	1.30008
33	1.00919	1.01222	6.38700	7.80640	1.26302	1.19261	1.53023	1.27819
34	1.00922	1.01223	6.44570	7.90180	1.25861	1.18373	1.51630	1.26276
35	1.00869	1.01221	6.50510	7.99840	1.25417	1.17491	1.50245	1.24751
36	1.00869	1.00605	6.56160	8.09610	1.25041	1.16615	1.48951	1.23246
37	1.00869	1.00606	6.61860	8.14510	1.24665	1.16457	1.47669	1.22504
38	1.00869	1.00605	6.67610	8.19450	1.24293	1.16296	1.46397	1.21766
39	1.00869	1.00605	6.73410	8.24410	1.23919	1.16138	1.45136	1.21033
40	1.00870	1.00605	6.79260	8.29400	1.23548	1.15979	1.43886	1.20305
41	1.00868	1.00605	6.85170	8.34420	1.23175	1.15821	1.42645	1.19581
42	1.00870	1.00605	6.91120	8.39470	1.22805	1.15662	1.41417	1.18862
43	1.00869	1.00605	6.97130	8.44550	1.22436	1.15504	1.40198	1.18147
44	1.00869	1.00606	7.03190	8.49660	1.22068	1.15347	1.38989	1.17436
45	1.00868	1.00605	7.09300	8.54810	1.21702	1.15188	1.37792	1.16729
46	1.00869	1.00467	7.15460	8.59980	1.21336	1.15032	1.36606	1.16027
47	1.00869	1.00469	7.21680	8.64000	1.20972	1.15032	1.35428	1.15487
48	1.00868	1.00468	7.27950	8.68050	1.20609	1.14948	1.34262	1.14948
49	1.00869	1.00468	7.34270	8.72110	1.20247	1.14413	1.33106	1.14413
50	1.00870	1.00468	7.40650	8.76190	1.19887	1.13881	1.31960	1.13881
51	1.00869	1.00468	7.47090	8.80290	1.19525	1.13350	1.30822	1.13350
52	1.00869	1.00467	7.53580	8.84410	1.19167	1.12822	1.29696	1.12822
53	1.00870	1.00468	7.60130	8.88540	1.18809	1.12298	1.28578	1.12298
54	1.00566	1.00468	7.66740	8.92700	1.18451	1.11774	1.27470	1.11774

Table 11. Growth factors from the NRG U.S. Lower 48 Reservoirs Monotone —1998 model (E.D. Attanasi, written commun., 2001)—Continued.

Years since discovery	Annual oil factors	Annual gas factors	Cumulative oil factors	Cumulative gas factors	Multipliers, for forecasts			
					30-year oil	30-year gas	80-year oil	80-year gas
55	1.00565	1.00468	7.71080	8.96880	1.18451	1.11253	1.26752	1.11253
56	1.00566	1.00467	7.75440	9.01080	1.18451	1.10735	1.26039	1.10735
57	1.00567	1.00468	7.79830	9.05290	1.18451	1.10220	1.25330	1.10220
58	1.00565	1.00467	7.84250	9.09530	1.18451	1.09706	1.24624	1.09706
59	1.00567	1.00468	7.88680	9.13780	1.18452	1.09196	1.23924	1.09196
60	1.00566	1.00467	7.93150	9.18060	1.18452	1.08687	1.23225	1.08687
61	1.00565	1.00468	7.97640	9.22350	1.18452	1.08181	1.22531	1.08181
62	1.00566	1.00467	8.02150	9.26670	1.18452	1.07677	1.21843	1.07677
63	1.00567	1.00468	8.06690	9.31000	1.18452	1.07176	1.21157	1.07176
64	1.00566	1.00468	8.11260	9.35360	1.18452	1.06677	1.20474	1.06677
65	1.00566	1.00467	8.15850	9.39740	1.18452	1.06179	1.19797	1.06179
66	1.00566	1.00468	8.20470	9.44130	1.18452	1.05686	1.19122	1.05686
67	1.00567	1.00468	8.25110	9.48550	1.18452	1.05193	1.18452	1.05193
68	1.00565	1.00468	8.29790	9.52990	1.17784	1.04703	1.17784	1.04703
69	1.00567	1.00468	8.34480	9.57450	1.17122	1.04215	1.17122	1.04215
70	1.00566	1.00468	8.39210	9.61930	1.16462	1.03730	1.16462	1.03730
71	1.00565	1.00468	8.43960	9.66430	1.15806	1.03247	1.15806	1.03247
72	1.00567	1.00468	8.48730	9.70950	1.15156	1.02766	1.15156	1.02766
73	1.00566	1.00468	8.53540	9.75490	1.14507	1.02288	1.14507	1.02288
74	1.00566	1.00467	8.58370	9.80060	1.13862	1.01811	1.13862	1.01811
75	1.00565	1.00468	8.63230	9.84640	1.13221	1.01338	1.13221	1.01338
76	1.00567	1.00468	8.68110	9.89250	1.12585	1.00865	1.12585	1.00865
77	1.00566	1.00395	8.73030	9.93880	1.11950	1.00395	1.11950	1.00395
78	1.00566	1.00000	8.77970	9.97810	1.11320	1.00000	1.11320	1.00000
79	1.00566	1.00000	8.82940	9.97810	1.10694	1.00000	1.10694	1.00000
80	1.00565	1.00000	8.87940	9.97810	1.10071	1.00000	1.10071	1.00000
81	1.00567	1.00000	8.92960	9.97810	1.09452	1.00000	1.09452	1.00000
82	1.00566	1.00000	8.98020	9.97810	1.08835	1.00000	1.08835	1.00000
83	1.00566	1.00000	9.03100	9.97810	1.08223	1.00000	1.08223	1.00000
84	1.00566	1.00000	9.08210	9.97810	1.07614	1.00000	1.07614	1.00000
85	1.00566	1.00000	9.13350	9.97810	1.07008	1.00000	1.07008	1.00000
86	1.00566	1.00000	9.18520	9.97810	1.06406	1.00000	1.06406	1.00000
87	1.00566	1.00000	9.23720	9.97810	1.05807	1.00000	1.05807	1.00000
88	1.00566	1.00000	9.28950	9.97810	1.05211	1.00000	1.05211	1.00000
89	1.00566	1.00000	9.34210	9.97810	1.04619	1.00000	1.04619	1.00000
90	1.00566	1.00000	9.39500	9.97810	1.04030	1.00000	1.04030	1.00000
91	1.00565	1.00000	9.44820	9.97810	1.03444	1.00000	1.03444	1.00000
92	1.00566	1.00000	9.50160	9.97810	1.02863	1.00000	1.02863	1.00000
93	1.00566	1.00000	9.55540	9.97810	1.02284	1.00000	1.02284	1.00000
94	1.00566	1.00000	9.60950	9.97810	1.01708	1.00000	1.01708	1.00000
95	1.00566	1.00000	9.66390	9.97810	1.01135	1.00000	1.01135	1.00000
96	1.00566	1.00000	9.71860	9.97810	1.00566	1.00000	1.00566	1.00000
97	1.00000	1.00000	9.77360	9.97810	1.00000	1.00000	1.00000	1.00000
98	1.00000	1.00000	9.77360	9.97810	1.00000	1.00000	1.00000	1.00000
99	1.00000	1.00000	9.77360	9.97810	1.00000	1.00000	1.00000	1.00000
100	1.00000	1.00000	9.77360	9.97810	1.00000	1.00000	1.00000	1.00000

Table 12. Growth factors from the U.S. Lower 48 Mean—1991 model (Schmoker and Klett, 2000).

Years since discovery	Annual mean oil and gas factors	Cumulative mean oil and gas factors	Multipliers, for forecasts	
			30-year mean oil and gas	80-year mean oil and gas
0	1.90850	1.00000	6.02308	9.04433
1	1.29629	1.90850	3.20218	4.76691
2	1.14693	2.47397	2.50038	3.69929
3	1.08773	2.83748	2.20650	3.24451
4	1.06154	3.08640	2.05186	3.00060
5	1.05404	3.27633	1.95502	2.84337
6	1.05415	3.45338	1.87605	2.71360
7	1.05089	3.64038	1.79998	2.58924
8	1.04227	3.82566	1.73047	2.47855
9	1.04015	3.98736	1.67723	2.39188
10	1.03886	4.14744	1.62926	2.31312
11	1.03262	4.30859	1.58328	2.22660
12	1.01912	4.44914	1.54786	2.15626
13	1.01842	4.53418	1.53337	2.11582
14	1.01830	4.61768	1.52002	2.07756
15	1.01849	4.70217	1.50694	2.04023
16	1.01847	4.78913	1.49376	2.00318
17	1.01833	4.87758	1.48059	1.96686
18	1.01850	4.96700	1.46790	1.93145
19	1.01614	5.05891	1.45245	1.89636
20	1.01607	5.14054	1.44042	1.86624
21	1.01611	5.22317	1.42850	1.83672
22	1.01604	5.30729	1.41673	1.80761
23	1.01625	5.39244	1.40525	1.77907
24	1.01608	5.48007	1.39341	1.75062
25	1.01610	5.56822	1.38189	1.72290
26	1.01611	5.65785	1.37010	1.69561
27	1.01611	5.74900	1.35814	1.66873
28	1.01612	5.84164	1.34639	1.64226
29	1.01471	5.93579	1.33483	1.61622
30	1.01466	6.02308	1.32488	1.59279
31	1.01219	6.11136	1.31509	1.56978
32	1.01213	6.18588	1.30848	1.55087
33	1.01149	6.26091	1.30200	1.53229
34	1.01144	6.33287	1.29646	1.51488
35	1.01146	6.40531	1.29095	1.49774
36	1.01141	6.47872	1.28443	1.48077
37	1.01031	6.55263	1.27795	1.46407
38	1.01020	6.62018	1.27245	1.44913
39	1.01040	6.68772	1.26706	1.43450
40	1.00954	6.75727	1.26141	1.41973
41	1.00952	6.82171	1.25696	1.40632
42	1.00957	6.88665	1.25256	1.39306
43	1.00955	6.95256	1.24801	1.37985
44	1.00953	7.01898	1.24359	1.36679
45	1.00958	7.08589	1.23917	1.35389
46	1.00949	7.15379	1.23465	1.34104
47	1.00961	7.22169	1.23030	1.32843
48	1.00778	7.29107	1.22584	1.31579
49	1.00772	7.34781	1.22356	1.30563
50	1.00766	7.40455	1.22145	1.29562
51	1.00774	7.46129	1.21931	1.28577
52	1.00781	7.51902	1.21717	1.27590

Table 12. Growth factors from the U.S. Lower 48 Mean—1991 model (Schmoker and Klett, 2000)—*Continued.*

Years since discovery	Annual mean oil and gas factors	Cumulative mean oil and gas factors	Multipliers, for forecasts	
			30-year mean oil and gas	80-year mean oil and gas
53	1.00768	7.57774	1.21491	1.26601
54	1.00769	7.63597	1.21282	1.25363
55	1.00743	7.69468	1.21068	1.24677
56	1.00724	7.75183	1.20889	1.23758
57	1.00732	7.80797	1.20721	1.22868
58	1.00739	7.86512	1.20558	1.21975
59	1.00714	7.92326	1.20371	1.21080
60	1.00716	7.97987	1.20221	1.20221
61	1.00711	8.03699	1.19367	1.19367
62	1.00712	8.09410	1.18525	1.18525
63	1.00719	8.15171	1.17687	1.17687
64	1.00714	8.21034	1.16847	1.16847
65	1.00635	8.26895	1.16018	1.16018
66	1.00631	8.32144	1.15287	1.15287
67	1.00596	8.37392	1.14564	1.14564
68	1.00593	8.42384	1.13885	1.13885
69	1.00589	8.47376	1.13214	1.13214
70	1.00597	8.52367	1.12551	1.12551
71	1.00599	8.57458	1.11883	1.11883
72	1.00590	8.62597	1.11217	1.11217
73	1.00598	8.67684	1.10564	1.10564
74	1.00594	8.72873	1.09907	1.09907
75	1.00591	8.78060	1.09258	1.09258
76	1.00593	8.83245	1.08617	1.08617
77	1.00595	8.88481	1.07976	1.07976
78	1.00591	8.93766	1.07338	1.07338
79	1.00599	8.99049	1.06707	1.06707
80	1.00589	9.04433	1.06072	1.06072
81	1.00597	9.09764	1.05451	1.05451
82	1.00593	9.15194	1.04825	1.04825
83	1.00595	9.20624	1.04207	1.04207
84	1.00591	9.26105	1.03590	1.03590
85	1.00593	9.31582	1.02981	1.02981
86	1.00584	9.37107	1.02374	1.02374
87	1.00597	9.42583	1.01779	1.01779
88	1.00582	9.48206	1.01175	1.01175
89	1.00589	9.53729	1.00589	1.00589
90	1.00000	9.59351	1.00000	1.00000
91	1.00000	9.59351	1.00000	1.00000
92	1.00000	9.59351	1.00000	1.00000
93	1.00000	9.59351	1.00000	1.00000
94	1.00000	9.59351	1.00000	1.00000
95	1.00000	9.59351	1.00000	1.00000
96	1.00000	9.59351	1.00000	1.00000
97	1.00000	9.59351	1.00000	1.00000
98	1.00000	9.59351	1.00000	1.00000
99	1.00000	9.59351	1.00000	1.00000
100	1.00000	9.59351	1.00000	1.00000

Table 13. Growth factors from the U.S. Lower 48 Monotone—1991 model (Root and others, 1997).

Years since discovery	Annual oil factors	Annual gas factors	Cumulative oil factors	Cumulative gas factors	Multipliers, for forecasts			
					30-year oil	30-year gas	80-year oil	80-year gas
0	1.99600	1.82100	1.00000	1.00000	6.11200	5.92100	9.30100	8.77300
1	1.29659	1.29599	1.99600	1.82100	3.10120	3.30533	4.69138	4.84185
2	1.14683	1.14703	2.58800	2.36000	2.42272	2.57966	3.64297	3.75508
3	1.07682	1.09863	2.96800	2.70700	2.13949	2.27484	3.19811	3.29036
4	1.04944	1.07364	3.19600	2.97400	2.01220	2.09180	2.98999	3.01042
5	1.04919	1.05888	3.35400	3.19300	1.94186	1.96806	2.86852	2.81804
6	1.04945	1.05886	3.51900	3.38100	1.87468	1.87726	2.75277	2.67465
7	1.04955	1.05223	3.69300	3.58000	1.80910	1.79078	2.64067	2.53855
8	1.04180	1.04274	3.87600	3.76700	1.74174	1.71914	2.53328	2.42474
9	1.04185	1.03844	4.03800	3.92800	1.68920	1.66522	2.44799	2.33681
10	1.03922	1.03849	4.20700	4.07900	1.63846	1.62000	2.36558	2.26158
11	1.02676	1.03848	4.37200	4.23600	1.59309	1.57342	2.27630	2.17776
12	1.02027	1.01796	4.48900	4.39900	1.56761	1.52830	2.21697	2.09707
13	1.02031	1.01653	4.58000	4.47800	1.55262	1.51429	2.17293	2.06007
14	1.02012	1.01648	4.67300	4.55200	1.53756	1.50264	2.12968	2.02658
15	1.02035	1.01664	4.76700	4.62700	1.52297	1.49103	2.08769	1.99373
16	1.02035	1.01658	4.86400	4.70400	1.50822	1.47938	2.04605	1.96110
17	1.02015	1.01652	4.96300	4.78200	1.49345	1.46780	2.00524	1.92911
18	1.02034	1.01666	5.06300	4.86100	1.47936	1.45649	1.96563	1.89776
19	1.01568	1.01659	5.16600	4.94200	1.45974	1.44516	1.92644	1.86665
20	1.01563	1.01652	5.24700	5.02400	1.44692	1.43392	1.89670	1.83619
21	1.01576	1.01645	5.32900	5.10700	1.43423	1.42275	1.86752	1.80634
22	1.01552	1.01657	5.41300	5.19100	1.42158	1.41187	1.83854	1.77711
23	1.01583	1.01668	5.49700	5.27700	1.40950	1.40099	1.81044	1.74815
24	1.01558	1.01659	5.58400	5.36500	1.39685	1.38993	1.78223	1.71948
25	1.01569	1.01650	5.67100	5.45400	1.38476	1.37899	1.75489	1.69142
26	1.01563	1.01659	5.76000	5.54400	1.37274	1.36742	1.72778	1.66396
27	1.01573	1.01650	5.85000	5.63600	1.36068	1.35557	1.70120	1.63680
28	1.01565	1.01658	5.94200	5.72900	1.34870	1.34404	1.67486	1.61023
29	1.01276	1.01666	6.03500	5.82400	1.33703	1.33259	1.64905	1.58396
30	1.01276	1.01655	6.11200	5.92100	1.32919	1.32055	1.62827	1.55801
31	1.01292	1.01146	6.19000	6.01900	1.32132	1.30886	1.60775	1.53265
32	1.01276	1.01150	6.27000	6.08800	1.31324	1.30371	1.58724	1.51528
33	1.01276	1.01023	6.35000	6.15800	1.30551	1.29847	1.56724	1.49805
34	1.01275	1.01013	6.43100	6.22100	1.29778	1.29513	1.54750	1.48288
35	1.01290	1.01003	6.51300	6.28400	1.29019	1.29169	1.52802	1.46801
36	1.01273	1.01008	6.59700	6.34700	1.28240	1.28643	1.50856	1.45344
37	1.01048	1.01014	6.68100	6.41100	1.27496	1.28092	1.48960	1.43893
38	1.01037	1.01004	6.75100	6.47600	1.27033	1.27455	1.47415	1.42449
39	1.01056	1.01024	6.82100	6.54100	1.26580	1.26831	1.45902	1.41033
40	1.01045	1.00863	6.89300	6.60800	1.26099	1.26180	1.44378	1.39604
41	1.01034	1.00870	6.96500	6.66500	1.25642	1.25746	1.42886	1.38410
42	1.01052	1.00863	7.03700	6.72300	1.25210	1.25301	1.41424	1.37216
43	1.01041	1.00870	7.11100	6.78100	1.24750	1.24849	1.39952	1.36042
44	1.01044	1.00863	7.18500	6.84000	1.24301	1.24415	1.38511	1.34868
45	1.01047	1.00870	7.26000	6.89900	1.23857	1.23974	1.37080	1.33715
46	1.01036	1.00862	7.33600	6.95900	1.23405	1.23523	1.35660	1.32562
47	1.01052	1.00869	7.41200	7.01900	1.22963	1.23094	1.34269	1.31429
48	1.00681	1.00876	7.49000	7.08000	1.22510	1.22655	1.32870	1.30297
49	1.00676	1.00868	7.54100	7.14200	1.22504	1.22207	1.31972	1.29165
50	1.00672	1.00861	7.59200	7.20400	1.22511	1.21780	1.31085	1.28054
51	1.00680	1.00867	7.64300	7.26600	1.22517	1.21346	1.30211	1.26961
52	1.00689	1.00873	7.69500	7.32900	1.22521	1.20917	1.29331	1.25870
53	1.00671	1.00866	7.74800	7.39300	1.22509	1.20479	1.28446	1.24780
54	1.00679	1.00858	7.80000	7.45700	1.22513	1.20062	1.27590	1.23709

Table 13. Growth factors from the U.S. Lower 48 Monotone—1991 model (Root and others, 1997)—Continued.

Years since discovery	Annual oil factors	Annual gas factors	Cumulative oil factors	Cumulative gas factors	Multipliers, for forecasts			
					30-year oil	30-year gas	80-year oil	80-year gas
55	1.00688	1.00798	7.85300	7.52100	1.22514	1.19638	1.26729	1.22657
56	1.00670	1.00778	7.90700	7.58100	1.22512	1.19285	1.25863	1.21686
57	1.00678	1.00785	7.96000	7.64000	1.22513	1.18953	1.25025	1.20746
58	1.00686	1.00792	8.01400	7.70000	1.22523	1.18623	1.24183	1.19805
59	1.00682	1.00747	8.06900	7.76100	1.22506	1.18271	1.23336	1.18864
60	1.00677	1.00755	8.12400	7.81900	1.22501	1.17982	1.22501	1.17982
61	1.00672	1.00749	8.17900	7.87800	1.21677	1.17098	1.21677	1.17098
62	1.00680	1.00743	8.23400	7.93700	1.20865	1.16228	1.20865	1.16228
63	1.00676	1.00763	8.29000	7.99600	1.20048	1.15370	1.20048	1.15370
64	1.00683	1.00745	8.34600	8.05700	1.19243	1.14497	1.19243	1.14497
65	1.00678	1.00591	8.40300	8.11700	1.18434	1.13650	1.18434	1.13650
66	1.00686	1.00576	8.46000	8.16500	1.17636	1.12982	1.17636	1.12982
67	1.00681	1.00511	8.51800	8.21200	1.16835	1.12336	1.16835	1.12336
68	1.00676	1.00509	8.57600	8.25400	1.16045	1.11764	1.16045	1.11764
69	1.00672	1.00506	8.63400	8.29600	1.15265	1.11198	1.15265	1.11198
70	1.00679	1.00516	8.69200	8.33800	1.14496	1.10638	1.14496	1.10638
71	1.00686	1.00513	8.75100	8.38100	1.13724	1.10070	1.13724	1.10070
72	1.00681	1.00499	8.81100	8.42400	1.12950	1.09509	1.12950	1.09509
73	1.00676	1.00520	8.87100	8.46600	1.12186	1.08965	1.12186	1.08965
74	1.00683	1.00505	8.93100	8.51000	1.11432	1.08402	1.11432	1.08402
75	1.00678	1.00503	8.99200	8.55300	1.10676	1.07857	1.10676	1.07857
76	1.00674	1.00512	9.05300	8.59600	1.09930	1.07317	1.09930	1.07317
77	1.00680	1.00509	9.11400	8.64000	1.09195	1.06771	1.09195	1.06771
78	1.00676	1.00507	9.17600	8.68400	1.08457	1.06230	1.08457	1.06230
79	1.00682	1.00516	9.23800	8.72800	1.07729	1.05694	1.07729	1.05694
80	1.00677	1.00502	9.30100	8.77300	1.06999	1.05152	1.06999	1.05152
81	1.00683	1.00510	9.36400	8.81700	1.06279	1.04627	1.06279	1.04627
82	1.00679	1.00508	9.42800	8.86200	1.05558	1.04096	1.05558	1.04096
83	1.00674	1.00516	9.49200	8.90700	1.04846	1.03570	1.04846	1.03570
84	1.00680	1.00503	9.55600	8.95300	1.04144	1.03038	1.04144	1.03038
85	1.00686	1.00500	9.62100	8.99800	1.03440	1.02523	1.03440	1.02523
86	1.00671	1.00498	9.68700	9.04300	1.02736	1.02013	1.02736	1.02013
87	1.00687	1.00506	9.75200	9.08800	1.02051	1.01507	1.02051	1.01507
88	1.00672	1.00493	9.81900	9.13400	1.01355	1.00996	1.01355	1.00996
89	1.00678	1.00501	9.88500	9.17900	1.00678	1.00501	1.00678	1.00501
90	1.00000	1.00000	9.95200	9.22500	1.00000	1.00000	1.00000	1.00000
91	1.00000	1.00000	9.95200	9.22500	1.00000	1.00000	1.00000	1.00000
92	1.00000	1.00000	9.95200	9.22500	1.00000	1.00000	1.00000	1.00000
93	1.00000	1.00000	9.95200	9.22500	1.00000	1.00000	1.00000	1.00000
94	1.00000	1.00000	9.95200	9.22500	1.00000	1.00000	1.00000	1.00000
95	1.00000	1.00000	9.95200	9.22500	1.00000	1.00000	1.00000	1.00000
96	1.00000	1.00000	9.95200	9.22500	1.00000	1.00000	1.00000	1.00000
97	1.00000	1.00000	9.95200	9.22500	1.00000	1.00000	1.00000	1.00000
98	1.00000	1.00000	9.95200	9.22500	1.00000	1.00000	1.00000	1.00000
99	1.00000	1.00000	9.95200	9.22500	1.00000	1.00000	1.00000	1.00000
100	1.00000	1.00000	9.95200	9.22500	1.00000	1.00000	1.00000	1.00000

Table 14. Growth factors from the U.S. Lower 48 Monotone—1996 model (E.D. Attanasi, written commun., 2001).

Years since discovery	Annual oil factors	Annual gas factors	Cumulative oil factors	Cumulative gas factors	Multipliers, for forecasts			
					30-year oil	30-year gas	80-year oil	80-year gas
0	1.98172	1.73034	1.00000	1.00000	4.96669	5.63108	7.20507	8.50209
1	1.13918	1.36730	1.98172	1.73034	2.53956	3.30815	3.65592	4.93152
2	1.13919	1.16233	2.25754	2.36589	2.25891	2.45250	3.22703	3.61996
3	1.05491	1.07925	2.57176	2.74995	2.00927	2.13398	2.84845	3.12579
4	1.04863	1.06714	2.71298	2.96789	1.93000	1.99636	2.71515	2.90685
5	1.04862	1.05452	2.84490	3.16715	1.86497	1.88883	2.60360	2.73393
6	1.04863	1.05452	2.98323	3.33982	1.80212	1.80847	2.49663	2.60208
7	1.04668	1.04779	3.12830	3.52191	1.73623	1.73122	2.39405	2.47657
8	1.03724	1.03134	3.27433	3.69021	1.67482	1.66793	2.29996	2.37227
9	1.03724	1.02973	3.39626	3.80586	1.63028	1.63257	2.22968	2.30860
10	1.03724	1.02973	3.52274	3.91901	1.58692	1.60047	2.16154	2.25015
11	1.02290	1.02624	3.65392	4.03553	1.54472	1.56899	2.09549	2.19318
12	1.02208	1.02307	3.73758	4.14141	1.52473	1.54336	2.05994	2.14492
13	1.02208	1.02220	3.82009	4.23697	1.50620	1.52285	2.02661	2.10422
14	1.01867	1.01654	3.90442	4.33101	1.48790	1.50391	1.99383	2.06606
15	1.01867	1.01654	3.97731	4.40265	1.47473	1.49346	1.96814	2.03988
16	1.01867	1.01654	4.05156	4.47548	1.46168	1.48308	1.93207	2.00669
17	1.01867	1.01654	4.12719	4.54951	1.44875	1.47277	1.89667	1.97403
18	1.01768	1.01654	4.20424	4.62477	1.43594	1.46254	1.86191	1.94191
19	1.01368	1.01654	4.27855	4.70127	1.41882	1.45238	1.82957	1.91031
20	1.01369	1.01654	4.33710	4.77903	1.40742	1.44229	1.80487	1.87923
21	1.01369	1.01654	4.39646	4.85809	1.39611	1.43226	1.78050	1.84864
22	1.01369	1.01654	4.45664	4.93845	1.38490	1.42231	1.75646	1.81856
23	1.01369	1.01654	4.51763	5.02014	1.37377	1.41243	1.73275	1.78897
24	1.01369	1.01654	4.57946	5.10318	1.36273	1.40262	1.70935	1.75986
25	1.01369	1.01654	4.64214	5.18759	1.35179	1.39287	1.68627	1.73122
26	1.01369	1.01654	4.70568	5.27340	1.34092	1.38319	1.66350	1.70305
27	1.01369	1.01654	4.77008	5.36063	1.33015	1.37358	1.64104	1.67534
28	1.01369	1.01654	4.83537	5.44931	1.31946	1.36404	1.61889	1.64808
29	1.01329	1.01654	4.90155	5.53945	1.30886	1.35456	1.59703	1.62126
30	1.01329	1.01654	4.96669	5.63108	1.29886	1.34237	1.57608	1.59488
31	1.01329	1.01365	5.03270	5.72422	1.28893	1.33028	1.55541	1.56893
32	1.01329	1.01137	5.09959	5.80234	1.27907	1.32207	1.53501	1.54780
33	1.01329	1.00966	5.16737	5.86833	1.26929	1.31687	1.51487	1.53040
34	1.01329	1.00966	5.23604	5.92499	1.25959	1.31391	1.49501	1.51576
35	1.01329	1.00966	5.30564	5.98220	1.24995	1.31096	1.47539	1.50127
36	1.01029	1.00948	5.37615	6.03997	1.24040	1.30802	1.45604	1.48691
37	1.00966	1.00948	5.43145	6.09721	1.23457	1.30532	1.44122	1.47295
38	1.00966	1.00948	5.48390	6.15501	1.22954	1.30262	1.42743	1.45912
39	1.00966	1.00948	5.53685	6.21334	1.22453	1.29992	1.41378	1.44542
40	1.00966	1.00948	5.59031	6.27224	1.21954	1.29723	1.40026	1.43185
41	1.00966	1.00948	5.64429	6.33169	1.21458	1.29455	1.38687	1.41840
42	1.00966	1.00948	5.69879	6.39170	1.20963	1.29187	1.37361	1.40508
43	1.00965	1.00948	5.75382	6.45228	1.20470	1.28443	1.36047	1.39189
44	1.00966	1.00948	5.80937	6.51344	1.19979	1.27702	1.34746	1.37882
45	1.00965	1.00948	5.86547	6.57517	1.19490	1.26966	1.33458	1.36588
46	1.00966	1.00948	5.92210	6.63749	1.19004	1.26234	1.32181	1.35305
47	1.00966	1.00948	5.97928	6.70040	1.18519	1.25507	1.30917	1.34035
48	1.00554	1.00948	6.03702	6.76391	1.18036	1.24783	1.29665	1.32776
49	1.00554	1.00948	6.07048	6.82802	1.18036	1.24064	1.28950	1.31530
50	1.00554	1.00948	6.10413	6.89274	1.18036	1.23348	1.28240	1.30295
51	1.00554	1.00948	6.13796	6.95807	1.18036	1.22637	1.27533	1.29071
52	1.00554	1.00948	6.17198	7.02402	1.18036	1.21931	1.26830	1.27860
53	1.00554	1.00948	6.20619	7.09060	1.18036	1.21228	1.26131	1.26659
54	1.00554	1.00948	6.24059	7.15780	1.18036	1.20529	1.25435	1.25470

Table 14. Growth factors from the U.S. Lower 48 Monotone—1996 model (E.D. Attanasi, written commun., 2001)—Continued.

Years since discovery	Annual oil factors	Annual gas factors	Cumulative oil factors	Cumulative gas factors	Multipliers, for forecasts			
					30-year oil	30-year gas	80-year oil	80-year gas
55	1.00554	1.00948	6.27518	7.22565	1.18036	1.19834	1.24744	1.24292
56	1.00554	1.00948	6.30996	7.29413	1.18036	1.19143	1.24056	1.23125
57	1.00554	1.00948	6.34493	7.36327	1.18036	1.18456	1.23373	1.21969
58	1.00554	1.00948	6.38010	7.43306	1.18036	1.17774	1.22693	1.20823
59	1.00554	1.00739	6.41546	7.50351	1.18036	1.17095	1.22016	1.19689
60	1.00554	1.00739	6.45102	7.55897	1.18036	1.16661	1.21344	1.18811
61	1.00554	1.00739	6.48678	7.61483	1.18036	1.16229	1.20675	1.17939
62	1.00554	1.00739	6.52273	7.67111	1.18036	1.15798	1.20010	1.17074
63	1.00554	1.00739	6.55888	7.72780	1.18036	1.15369	1.19348	1.16215
64	1.00554	1.00739	6.59524	7.78491	1.18036	1.14942	1.18690	1.15363
65	1.00554	1.00739	6.63179	7.84245	1.18036	1.14516	1.18036	1.14516
66	1.00554	1.00739	6.66855	7.90041	1.17385	1.13676	1.17385	1.13676
67	1.00554	1.00739	6.70551	7.95879	1.16738	1.12842	1.16738	1.12842
68	1.00554	1.00739	6.74268	8.01761	1.16095	1.12014	1.16095	1.12014
69	1.00554	1.00739	6.78005	8.07687	1.15455	1.11193	1.15455	1.11193
70	1.00554	1.00739	6.81763	8.13656	1.14819	1.10377	1.14819	1.10377
71	1.00554	1.00739	6.85542	8.19669	1.14186	1.09567	1.14186	1.09567
72	1.00554	1.00366	6.89341	8.25727	1.13556	1.08763	1.13556	1.08763
73	1.00554	1.00366	6.93162	8.28748	1.12930	1.08367	1.12930	1.08367
74	1.00554	1.00366	6.97004	8.31781	1.12308	1.07972	1.12308	1.07972
75	1.00554	1.00366	7.00867	8.34824	1.11689	1.07578	1.11689	1.07578
76	1.00554	1.00366	7.04752	8.37879	1.11073	1.07186	1.11073	1.07186
77	1.00554	1.00366	7.08658	8.40944	1.10461	1.06795	1.10461	1.06795
78	1.00554	1.00366	7.12586	8.44022	1.09852	1.06406	1.09852	1.06406
79	1.00554	1.00366	7.16536	8.47110	1.09247	1.06018	1.09247	1.06018
80	1.00554	1.00366	7.20507	8.50209	1.08644	1.05631	1.08644	1.05631
81	1.00554	1.00366	7.24501	8.53320	1.08046	1.05246	1.08046	1.05246
82	1.00554	1.00366	7.28516	8.56443	1.07450	1.04863	1.07450	1.04863
83	1.00554	1.00366	7.32554	8.59576	1.06858	1.04480	1.06858	1.04480
84	1.00554	1.00366	7.36615	8.62722	1.06269	1.04099	1.06269	1.04099
85	1.00554	1.00366	7.40697	8.65878	1.05683	1.03720	1.05683	1.03720
86	1.00554	1.00366	7.44803	8.69047	1.05100	1.03342	1.05100	1.03342
87	1.00554	1.00366	7.48931	8.72226	1.04521	1.02965	1.04521	1.02965
88	1.00554	1.00366	7.53082	8.75418	1.03945	1.02590	1.03945	1.02590
89	1.00554	1.00366	7.57256	8.78621	1.03372	1.02216	1.03372	1.02216
90	1.00554	1.00366	7.61453	8.81836	1.02802	1.01843	1.02802	1.01843
91	1.00554	1.00366	7.65674	8.85063	1.02236	1.01472	1.02236	1.01472
92	1.00554	1.00366	7.69918	8.88301	1.01672	1.01102	1.01672	1.01102
93	1.00554	1.00366	7.74185	8.91551	1.01112	1.00733	1.01112	1.00733
94	1.00554	1.00366	7.78476	8.94814	1.00554	1.00366	1.00554	1.00366
95	1.00000	1.00000	7.82791	8.98088	1.00000	1.00000	1.00000	1.00000
96	1.00000	1.00000	7.82791	8.98088	1.00000	1.00000	1.00000	1.00000
97	1.00000	1.00000	7.82791	8.98088	1.00000	1.00000	1.00000	1.00000
98	1.00000	1.00000	7.82791	8.98088	1.00000	1.00000	1.00000	1.00000
99	1.00000	1.00000	7.82791	8.98088	1.00000	1.00000	1.00000	1.00000
100	1.00000	1.00000	7.82791	8.98088	1.00000	1.00000	1.00000	1.00000

Table 15. Recoverable oil and natural gas volumes by age and type in conventional fields and reservoirs of the Lower 48 United States, located onshore and in State waters, as reported in the Energy Information Administration (1996) and NRG Associates (1998) databases.

Energy Information Administration (1996), field data				NRG Associates (1998), field data (≥ 1 MMBOE)				NRG Associates (1998), reservoir data (in fields ≥ 1 MMBOE)			
Field type	Discovery year	Oil (MMBO)	Gas (BCFG)	Field type	Discovery year	Oil (MMBO)	Gas (BCFG)	Reservoir type	Discovery year	Oil (MMBO)	Gas (BCFG)
Gas	1996	2	334	Gas	1998	0	212	Gas	1998	0	394
Oil	1996	29	62	Oil	1998	0	0	Oil	1998	2	1
Gas	1995	6	852	Gas	1997	0	426	Gas	1997	0	614
Oil	1995	71	200	Oil	1997	39	95	Oil	1997	47	104
Gas	1994	3	811	Gas	1996	1	300	Gas	1996	1	629
Oil	1994	78	203	Oil	1996	32	65	Oil	1996	41	73
Gas	1993	7	822	Gas	1995	0	982	Gas	1995	0	1,035
Oil	1993	54	55	Oil	1995	22	18	Oil	1995	39	84
Gas	1992	5	642	Gas	1994	0	773	Gas	1994	0	1,110
Oil	1992	79	135	Oil	1994	101	77	Oil	1994	130	149
Gas	1991	3	455	Gas	1993	0	365	Gas	1993	0	614
Oil	1991	90	216	Oil	1993	24	27	Oil	1993	42	32
Gas	1990	6	2,102	Gas	1992	0	345	Gas	1992	0	687
Oil	1990	70	141	Oil	1992	40	72	Oil	1992	49	95
Gas	1989	9	949	Gas	1991	1	396	Gas	1991	0	431
Oil	1989	87	242	Oil	1991	63	87	Oil	1991	60	92
Gas	1988	10	1,092	Gas	1990	2	1,570	Gas	1990	1	1,622
Oil	1988	102	211	Oil	1990	42	87	Oil	1990	50	96
Gas	1987	7	620	Gas	1989	1	1,280	Gas	1989	1	1,589
Oil	1987	126	268	Oil	1989	73	181	Oil	1989	75	151
Gas	1986	5	1,334	Gas	1988	0	818	Gas	1988	0	966
Oil	1986	109	190	Oil	1988	68	182	Oil	1988	96	176
Gas	1985	12	2,008	Gas	1987	1	387	Gas	1987	0	547
Oil	1985	284	865	Oil	1987	83	162	Oil	1987	107	307
Gas	1984	13	1,373	Gas	1986	1	490	Gas	1986	0	654
Oil	1984	251	500	Oil	1986	78	63	Oil	1986	111	147
Gas	1983	20	2,298	Gas	1985	0	1,013	Gas	1985	1	2,895
Oil	1983	252	508	Oil	1985	177	403	Oil	1985	214	380
Gas	1982	26	2,566	Gas	1984	2	1,126	Gas	1984	0	1,760
Oil	1982	327	705	Oil	1984	176	350	Oil	1984	196	377
Gas	1981	35	4,972	Gas	1983	3	1,346	Gas	1983	3	1,300
Oil	1981	351	1,222	Oil	1983	162	288	Oil	1983	208	358
Gas	1980	37	3,173	Gas	1982	7	2,420	Gas	1982	7	2,744
Oil	1980	435	1,895	Oil	1982	172	343	Oil	1982	181	306
Gas	1979	62	7,031	Gas	1981	6	2,703	Gas	1981	4	3,034
Oil	1979	525	1,460	Oil	1981	284	886	Oil	1981	261	802
Gas	1978	96	6,946	Gas	1980	5	4,896	Gas	1980	2	4,803
Oil	1978	298	804	Oil	1980	184	316	Oil	1980	214	368
Gas	1977	53	6,383	Gas	1979	10	7,528	Gas	1979	5	9,402
Oil	1977	554	2,592	Oil	1979	264	677	Oil	1979	249	504

Table 15. Recoverable oil and natural gas volumes by age and type in conventional fields and reservoirs of the Lower 48 United States, located onshore and in State waters, as reported in the Energy Information Administration (1996) and NRG Associates (1998) databases—Continued.

Energy Information Administration (1996), field data				NRG Associates (1998), field data (≥ 1 MMBOE)				NRG Associates (1998), reservoir data (in fields ≥ 1 MMBOE)			
Field type	Discovery year	Oil (MMBO)	Gas (BCFG)	Field type	Discovery year	Oil (MMBO)	Gas (BCFG)	Reservoir type	Discovery year	Oil (MMBO)	Gas (BCFG)
Gas	1976	32	4,362	Gas	1978	6	3,753	Gas	1978	5	3,545
Oil	1976	577	1,118	Oil	1978	126	254	Oil	1978	220	294
Gas	1975	47	4,812	Gas	1977	11	7,374	Gas	1977	4	6,698
Oil	1975	342	652	Oil	1977	445	1,482	Oil	1977	467	1,407
Gas	1974	47	6,734	Gas	1976	4	3,316	Gas	1976	3	3,137
Oil	1974	614	1,586	Oil	1976	352	594	Oil	1976	216	394
Gas	1973	64	6,044	Gas	1975	12	3,479	Gas	1975	4	4,099
Oil	1973	278	874	Oil	1975	380	503	Oil	1975	392	630
Gas	1972	68	4,475	Gas	1974	12	4,230	Gas	1974	3	4,550
Oil	1972	671	2,697	Oil	1974	330	595	Oil	1974	330	679
Gas	1971	45	4,339	Gas	1973	33	4,169	Gas	1973	26	3,770
Oil	1971	309	1,029	Oil	1973	321	566	Oil	1973	397	749
Gas	1970	24	3,310	Gas	1972	30	3,962	Gas	1972	5	4,092
Oil	1970	1,153	1,906	Oil	1972	371	446	Oil	1972	405	587
Gas	1969	53	6,979	Gas	1971	13	5,365	Gas	1971	5	4,369
Oil	1969	467	902	Oil	1971	295	1,039	Oil	1971	588	1,371
Gas	1968	27	3,671	Gas	1970	8	2,306	Gas	1970	1	1,964
Oil	1968	449	875	Oil	1970	853	949	Oil	1970	868	890
Gas	1967	39	3,593	Gas	1969	4	3,236	Gas	1969	4	5,508
Oil	1967	487	944	Oil	1969	308	573	Oil	1969	433	702
Gas	1966	48	5,535	Gas	1968	4	3,517	Gas	1968	1	7,646
Oil	1966	547	808	Oil	1968	368	551	Oil	1968	389	490
Gas	1965	42	3,925	Gas	1967	6	3,588	Gas	1967	5	2,978
Oil	1965	630	1,314	Oil	1967	438	477	Oil	1967	447	481
Gas	1964	120	6,165	Gas	1966	10	5,310	Gas	1966	3	4,233
Oil	1964	681	1,010	Oil	1966	276	342	Oil	1966	382	369
Gas	1963	70	10,893	Gas	1965	20	3,705	Gas	1965	7	3,888
Oil	1963	565	1,262	Oil	1965	348	545	Oil	1965	401	670
Gas	1962	44	5,505	Gas	1964	6	6,302	Gas	1964	3	5,848
Oil	1962	734	1,779	Oil	1964	479	1,634	Oil	1964	622	1,824
Gas	1961	77	6,973	Gas	1963	13	8,627	Gas	1963	8	10,097
Oil	1961	521	726	Oil	1963	346	461	Oil	1963	344	507
Gas	1960	113	10,474	Gas	1962	37	8,507	Gas	1962	27	8,147
Oil	1960	998	3,618	Oil	1962	362	688	Oil	1962	555	733
Gas	1959	117	9,943	Gas	1961	25	7,431	Gas	1961	16	5,010
Oil	1959	982	2,659	Oil	1961	389	485	Oil	1961	420	458
Gas	1958	235	14,345	Gas	1960	27	7,378	Gas	1960	23	8,078
Oil	1958	1,650	3,179	Oil	1960	901	1,773	Oil	1960	823	1,167
Gas	1957	197	10,925	Gas	1959	55	7,509	Gas	1959	18	4,221
Oil	1957	1,228	2,459	Oil	1959	750	1,980	Oil	1959	751	1,842

Table 15. Recoverable oil and natural gas volumes by age and type in conventional fields and reservoirs of the Lower 48 United States, located onshore and in State waters, as reported in the Energy Information Administration (1996) and NRG Associates (1998) databases—Continued.

Energy Information Administration (1996), field data				NRG Associates (1998), field data (≥ 1 MMBOE)				NRG Associates (1998), reservoir data (in fields ≥ 1 MMBOE)			
Field type	Discovery year	Oil (MMBO)	Gas (BCFG)	Field type	Discovery year	Oil (MMBO)	Gas (BCFG)	Reservoir type	Discovery year	Oil (MMBO)	Gas (BCFG)
Gas	1956	146	13,974	Gas	1958	97	11,147	Gas	1958	59	7,818
Oil	1956	2,133	4,471	Oil	1958	976	1,481	Oil	1958	757	1,298
Gas	1955	97	8,848	Gas	1957	122	14,560	Gas	1957	19	9,008
Oil	1955	1,444	2,666	Oil	1957	1,083	2,166	Oil	1957	1,399	2,697
Gas	1954	208	11,508	Gas	1956	80	11,551	Gas	1956	46	10,014
Oil	1954	1,289	3,388	Oil	1956	1,583	2,731	Oil	1956	1,578	2,245
Gas	1953	213	15,333	Gas	1955	25	5,855	Gas	1955	21	5,868
Oil	1953	2,597	5,554	Oil	1955	1,158	2,107	Oil	1955	1,695	2,066
Gas	1952	159	13,744	Gas	1954	101	9,494	Gas	1954	21	7,258
Oil	1952	1,892	3,256	Oil	1954	993	2,395	Oil	1954	1,636	2,294
Gas	1951	158	9,775	Gas	1953	64	8,018	Gas	1953	46	6,142
Oil	1951	1,713	3,075	Oil	1953	2,015	4,478	Oil	1953	1,808	2,969
Gas	1950	43	3,439	Gas	1952	40	13,057	Gas	1952	30	7,130
Oil	1950	4,335	7,549	Oil	1952	1,417	2,214	Oil	1952	1,283	2,116
Gas	1949	236	15,566	Gas	1951	53	8,259	Gas	1951	23	4,137
Oil	1949	2,628	5,407	Oil	1951	1,428	2,992	Oil	1951	1,486	2,014
Gas	1948	181	7,635	Gas	1950	39	5,385	Gas	1950	32	5,084
Oil	1948	3,194	4,986	Oil	1950	2,268	3,281	Oil	1950	2,361	2,457
Gas	1947	129	5,385	Gas	1949	49	10,202	Gas	1949	49	5,581
Oil	1947	1,987	4,484	Oil	1949	4,594	10,757	Oil	1949	3,118	6,087
Gas	1946	124	12,193	Gas	1948	194	9,673	Gas	1948	14	2,454
Oil	1946	940	2,590	Oil	1948	2,926	3,671	Oil	1948	3,002	2,683
Gas	1945	391	15,456	Gas	1947	40	5,037	Gas	1947	17	2,844
Oil	1945	3,459	12,671	Oil	1947	1,510	3,394	Oil	1947	1,158	1,430
Gas	1944	147	8,508	Gas	1946	62	4,397	Gas	1946	47	4,209
Oil	1944	3,055	6,246	Oil	1946	668	1,705	Oil	1946	1,469	2,995
Gas	1943	81	5,534	Gas	1945	53	8,114	Gas	1945	35	6,033
Oil	1943	1,325	4,618	Oil	1945	2,534	6,970	Oil	1945	1,529	3,496
Gas	1942	153	6,391	Gas	1944	55	6,013	Gas	1944	34	6,025
Oil	1942	2,020	2,845	Oil	1944	2,908	3,554	Oil	1944	2,642	3,304
Gas	1941	95	7,215	Gas	1943	35	6,473	Gas	1943	22	1,983
Oil	1941	1,538	4,204	Oil	1943	1,397	3,688	Oil	1943	1,275	2,407
Gas	1940	170	7,619	Gas	1942	16	4,110	Gas	1942	27	2,134
Oil	1940	4,383	10,240	Oil	1942	1,367	2,412	Oil	1942	1,302	1,250
Gas	1939	26	3,078	Gas	1941	71	7,811	Gas	1941	16	2,251
Oil	1939	1,793	3,611	Oil	1941	1,694	3,246	Oil	1941	1,905	3,440
Gas	1938	192	18,090	Gas	1940	58	3,820	Gas	1940	50	4,597
Oil	1938	5,297	19,494	Oil	1940	3,140	7,252	Oil	1940	1,855	2,562
Gas	1937	339	15,983	Gas	1939	97	6,874	Gas	1939	63	5,323
Oil	1937	6,967	8,803	Oil	1939	1,187	4,240	Oil	1939	1,184	3,142

Table 15. Recoverable oil and natural gas volumes by age and type in conventional fields and reservoirs of the Lower 48 United States, located onshore and in State waters, as reported in the Energy Information Administration (1996) and NRG Associates (1998) databases—Continued.

Energy Information Administration (1996), field data				NRG Associates (1998), field data (≥ 1 MMBOE)				NRG Associates (1998), reservoir data (in fields ≥ 1 MMBOE)			
Field type	Discovery year	Oil (MMBO)	Gas (BCFG)	Field type	Discovery year	Oil (MMBO)	Gas (BCFG)	Reservoir type	Discovery year	Oil (MMBO)	Gas (BCFG)
Gas	1936	186	19,261	Gas	1938	119	8,132	Gas	1938	59	4,884
Oil	1936	3,038	6,567	Oil	1938	4,127	13,615	Oil	1938	2,230	4,664
Gas	1935	26	5,344	Gas	1937	156	12,552	Gas	1937	30	2,676
Oil	1935	3,055	6,820	Oil	1937	3,019	13,872	Oil	1937	1,342	1,492
Gas	1934	158	5,565	Gas	1936	123	21,630	Gas	1936	13	10,935
Oil	1934	2,631	4,888	Oil	1936	7,849	14,245	Oil	1936	6,590	7,898
Gas	1933	8	597	Gas	1935	36	8,787	Gas	1935	27	7,409
Oil	1933	1,159	2,682	Oil	1935	1,537	4,050	Oil	1935	1,093	3,397
Gas	1932	10	595	Gas	1934	153	7,427	Gas	1934	4	480
Oil	1932	3,292	1,824	Oil	1934	3,711	7,464	Oil	1934	2,423	4,126
Gas	1931	2	959	Gas	1933	0	999	Gas	1933	6	2,325
Oil	1931	2,197	3,635	Oil	1933	1,496	4,781	Oil	1933	1,515	2,916
Gas	1930	170	4,854	Gas	1932	2	2,059	Gas	1932	2	2,087
Oil	1930	8,277	8,182	Oil	1932	1,171	851	Oil	1932	639	800
Gas	1929	84	2,898	Gas	1931	0	501	Gas	1931	1	274
Oil	1929	4,455	6,109	Oil	1931	2,696	4,972	Oil	1931	1,716	2,247
Gas	1928	72	3,558	Gas	1930	32	7,292	Gas	1930	148	5,585
Oil	1928	3,202	8,033	Oil	1930	7,750	9,051	Oil	1930	7,445	4,023
Gas	1927	8	1,316	Gas	1929	2	3,041	Gas	1929	0	414
Oil	1927	2,125	4,774	Oil	1929	5,016	15,850	Oil	1929	2,638	9,493
Gas	1926	59	2,519	Gas	1928	153	6,061	Gas	1928	0	166
Oil	1926	4,419	1,874	Oil	1928	3,330	4,675	Oil	1928	2,139	2,724
Gas	1925	24	3,260	Gas	1927	23	1,066	Gas	1927	13	479
Oil	1925	1,545	561	Oil	1927	863	853	Oil	1927	604	492
Gas	1924	31	3,363	Gas	1926	5	1,036	Gas	1926	4	331
Oil	1924	1,325	1,598	Oil	1926	6,220	6,002	Oil	1926	4,505	2,152
Gas	1923	1	177	Gas	1925	1	187	Gas	1925	0	97
Oil	1923	1,525	1,897	Oil	1925	1,209	667	Oil	1925	1,968	1,950
Gas	1922	66	43,969	Gas	1924	142	7,059	Gas	1924	0	435
Oil	1922	1,774	2,973	Oil	1924	1,263	940	Oil	1924	543	860
Gas	1921	3	449	Gas	1923	22	710	Gas	1923	1	66
Oil	1921	1,996	2,377	Oil	1923	1,808	2,395	Oil	1923	1,075	729
Gas	1920	1	205	Gas	1922	112	5,041	Gas	1922	0	326
Oil	1920	2,562	2,094	Oil	1922	4,565	1,862	Oil	1922	4,040	1,542
Gas	1919	26	803	Gas	1921	0	646	Gas	1921	0	143
Oil	1919	2,828	3,196	Oil	1921	1,628	2,050	Oil	1921	1,044	978
Gas	1918	6	31,197	Gas	1920	1	185	Gas	1920	0	184
Oil	1918	1,015	769	Oil	1920	2,450	1,178	Oil	1920	811	505
Gas	1917	6	374	Gas	1919	0	172	Gas	1919	0	388
Oil	1917	1,162	806	Oil	1919	1,606	1,697	Oil	1919	1,000	985

Table 15. Recoverable oil and natural gas volumes by age and type in conventional fields and reservoirs of the Lower 48 United States, located onshore and in State waters, as reported in the Energy Information Administration (1996) and NRG Associates (1998) databases—Continued.

Energy Information Administration (1996), field data				NRG Associates (1998), field data (≥ 1 MMBOE)				NRG Associates (1998), reservoir data (in fields ≥ 1 MMBOE)			
Field type	Discovery year	Oil (MMBO)	Gas (BCFG)	Field type	Discovery year	Oil (MMBO)	Gas (BCFG)	Reservoir type	Discovery year	Oil (MMBO)	Gas (BCFG)
Gas	1916	114	11,842	Gas	1918	1,544	83,675	Gas	1918	1,523	76,494
Oil	1916	2,659	5,087	Oil	1918	2,375	3,048	Oil	1918	319	465
Gas	1915	1	153	Gas	1917	8	320	Gas	1917	0	25
Oil	1915	1,480	763	Oil	1917	1,112	2,381	Oil	1917	268	209
Gas	1914	2	3,548	Gas	1916	56	13,429	Gas	1916	0	196
Oil	1914	489	278	Oil	1916	1,127	1,257	Oil	1916	26	14
Gas	1913	0	157	Gas	1915	0	358	Gas	1915	0	5
Oil	1913	786	455	Oil	1915	1,967	1,492	Oil	1915	391	257
Gas	1912	0	112	Gas	1914	0	395	Gas	1914	0	115
Oil	1912	1,376	1,879	Oil	1914	622	409	Oil	1914	61	11
Gas	1911	0	0	Gas	1913	0	29	Gas	1913	0	9
Oil	1911	2,695	643	Oil	1913	900	510	Oil	1913	55	260
Gas	1910	0	2,608	Gas	1912	0	2,276	Gas	1912	0	28
Oil	1910	2,084	3,071	Oil	1912	1,546	1,593	Oil	1912	223	167
Gas	1909	0	85	Gas	1911	0	57	Gas	1911	0	0
Oil	1909	1,527	1,709	Oil	1911	3,881	2,920	Oil	1911	2,449	887
Gas	1908	0	89	Gas	1910	0	78	Gas	1910	0	78
Oil	1908	65	115	Oil	1910	1,198	927	Oil	1910	854	1,150
Gas	1907	0	2	Gas	1909	0	0	Gas	1909	0	101
Oil	1907	18	118	Oil	1909	1,526	1,586	Oil	1909	640	296
Gas	1906	0	1	Gas	1908	0	0	Gas	1908	0	0
Oil	1906	917	631	Oil	1908	1,151	1,038	Oil	1908	661	734
Gas	1905	0	7	Gas	1907	0	0	Gas	1907	0	0
Oil	1905	2,093	3,071	Oil	1907	136	690	Oil	1907	13	4
Gas	1904	0	84	Gas	1906	0	0	Gas	1906	0	0
Oil	1904	643	438	Oil	1906	581	279	Oil	1906	106	7
Gas	1903	0	10	Gas	1905	3	121	Gas	1905	3	121
Oil	1903	124	78	Oil	1905	447	51	Oil	1905	54	20
Gas	1902	0	11	Gas	1904	0	3,061	Gas	1904	0	1
Oil	1902	1,165	1,333	Oil	1904	2,813	1,518	Oil	1904	193	212
Gas	1901	0	102	Gas	1903	0	0	Gas	1903	0	0
Oil	1901	3,651	985	Oil	1903	195	327	Oil	1903	111	114
Gas	1900	0	104	Gas	1902	0	63	Gas	1902	0	63
Oil	1900	755	335	Oil	1902	332	499	Oil	1902	0	0
Gas	1899	4	507	Gas	1901	0	0	Gas	1901	0	0
Oil	1899	6,058	2,320	Oil	1901	3,989	945	Oil	1901	3,318	647
Gas	1898	998	29,344	Gas	1900	0	0	Gas	1900	0	0
Oil	1898	1,975	11,238	Oil	1900	161	215	Oil	1900	990	234
				Gas	1899	7	206	Gas	1899	7	171
				Oil	1899	4,819	2,790	Oil	1899	2,882	561

Table 15. Recoverable oil and natural gas volumes by age and type in conventional fields and reservoirs of the Lower 48 United States, located onshore and in State waters, as reported in the Energy Information Administration (1996) and NRG Associates (1998) databases—*Continued.*

Energy Information Administration (1996), field data				NRG Associates (1998), field data (≥ 1 MMBOE)				NRG Associates (1998), reservoir data (in fields ≥ 1 MMBOE)			
Field type	Discovery year	Oil (MMBO)	Gas (BCFG)	Field type	Discovery year	Oil (MMBO)	Gas (BCFG)	Reservoir type	Discovery year	Oil (MMBO)	Gas (BCFG)
		Gas	1898		0	8		Gas	1898	1	616
		Oil	1898		15	25		Oil	1898	78	76

Table 16. Estimated additions to U.S. reserves using forecast functions derived from the various reserve-growth models for conventional fields located onshore and in State waters of the Lower 48 United States.

Model	Potential additions to oil reserves (BBO)		Potential additions to gas reserves (TCFG)	
	30-year forecast	80-year forecast	30-year forecast	80-year forecast
Arrington model—1996	38	63	312	786
Mean of U.S. Lower 48 Annual Growth Factors—1996	49	123	1,467	6,038
MMS Federal Offshore—1996	4	4	48	50
NRG U.S. Lower 48 Fields Monotone—1998	29	43	202	307
U.S. Lower 48 Monotone—1991	30	42	191	289
U.S. Lower 48 Monotone—1996	27	40	189	293
NRG U.S. Lower 48 Fields Monotone—1998 (NRG data)*	23	33	160	233
NRG U.S. Lower 48 Reservoirs Monotone—1998 (NRG data)*	19	27	95	135

* Thirty- and 80-year forecasts from 1998 of field and reservoir sizes reported in 1998. All other forecasts are 30 and 80 years from 1996 of field sizes reported in 1996.